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FIVE-YEAR REVIEW REPORT

First Five-Year Review Report
For
Long Prairie Ground Water Contamination Superfund Site
Long Prairie
Todd County, Minnesota

September, 2002

PREPARED BY
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St. Paul and Duluth, Minnesota

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Date: 9/30/02

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Superfund Division
U.S. Environmental Protection Agency

Date: 9/30/02

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Attachments

List of Acronyms

AIC	Adult Intake Concentration
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
City	City of Long Prairie
CW	City Well
DCE	cis 1,2-Dichloroethylene, also known as Dichloroethene
DL	Detection Limit
DOC	Dissolved Organic Carbon
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FY	Fiscal Year
GAC	Granular Activated Carbon
GC	Gas Chromatograph
GC/MS	Gas Chromatograph / Mass Spectrophotometer
GPM	Gallons Per Minute
GRO	Gasoline Range Organics
GW	Ground water
HBV	Health Based Value
HQ	Hazard Quotient
HRL	Health Risk Limit
HRS	Hazard Ranking System
HUD	Housing and Urban Development
IRIS	Integrated Risk Information System
LTRA	Long Term Response Action
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDH	Minnesota Department of Health
MGD	Million Gallons per Day
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MN	Minnesota
MDH	Minnesota Department of Health
MNDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MW	Monitoring Well

NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PCE	Perchloroethylene, also known as 1,1,2,2-tetrachloroethylene, tetrachloroethylene or tetrachloroethene
PLP	Permanent List of Priorities
ppb	parts per billion or ug/L (water) or ug/kg (soil)
ppm	parts per million, or mg/L (water) or mg/kg (soil)
PRPs	Potentially Responsible Parties
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAL	Recommended Allowable Limit
RAO	Remedial Action Objective
RBSE	Risk-Based Site Evaluation
RCRA	Resource Conservation and Recovery Act of 1976
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Regional Project Manager (EPA)
RW	Recovery Well
SARA	Superfund Amendments and Reauthorization Act of 1986
SDWA	Safe Drinking Water Act
SPM	State Project Manager
SRV	Soil Reference Value
STW	Short-Term Worker
SVES	Soil Vapor Extraction System
SVOC	Semi-Volatile Organic Compound
TIO	U.S. EPA Technical Innovation Office
TBC	To Be Considered
TCE	1,1,2-trichloroethylene or trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
ug/kg	micrograms per kilogram
ug/L	Micrograms per Liter
VOC	Volatile Organic Compound

Executive Summary

The Long Prairie Ground Water Contamination Superfund Site (the Site) is a source area and plume of various synthetic organic compounds, namely perchloroethylene (PCE), which have contaminated a significant portion of the drinking water aquifer underlying the City of Long Prairie. The contaminant concentrations have exceeded their respective State of Minnesota Recommended Allowable Limits (RALs) at the time, thus necessitating the issuance of health advisories, bottled water and ultimately site remediation. The remedy selected and implemented at the Site included a ground water extraction and treatment system designed to reduce the concentration of PCE and related contaminants in the ground water to below the federal and State health-based limits, respectively known as Maximum Contaminant Levels (MCLs) and RALs for these compounds. A soil vapor extraction system was also installed to remove the contaminants from soils in the source area. In addition, a safe alternative potable water supply was also provided for residents using wells in the affected area.

Construction of the Site remedy was completed with the signing of the Preliminary Close Out Report (PCOR) on September 19, 1997. This is the first five-year review conducted for the Site. The trigger for this five-year review was the construction completion date for the Site.

This five-year review concluded that the remedy was constructed in accordance with the requirements of the June 1988 Record of Decision (ROD). An Explanation of Significant Difference (ESD) was issued in 1991 to support the replacement of the air-stripping unit with granular activated carbon units to treat contaminated ground water at an additional cost of about $330,000. A second ESD was signed in 1994 to document the necessity of regular ground water monitoring and to provide an alternate water supply to the residents via installation of a municipal water main and service connections.

The remedy is protective of human health and the environment in the short term. There are no current exposure pathways to the ground water contaminants under normal circumstances, although residents may be unaware of or may disregard the Minnesota Department of Health (MDH) health advisories by using existing wells or installing new wells into the aquifer. Communications with residents regarding the Site ground water contamination will continue on a regular basis. The remedy is currently functioning according to design and is anticipated to remain functional in the future in its expanded design capacity. The soil vapor extraction (SVE) system has achieved its remedial objective of removing PCE from the soil at the property where this solvent was used for commercial dry-cleaning purposes. The soil had acted as a continuous source of ground water contamination by leaching into the ground water. By removing the primary contaminant source, further impact of the ground water supply has been prevented.

Significant public health benefits have also been achieved by interrupting exposure pathways such as ingestion and direct contact with contaminated soils. The success of the SVE expedited the attainment of the ground water remedial objectives of providing safe drinking

system water to present and future users of the Long Prairie Sand Plain aquifer as well as to prevent the spread of contaminated ground water to wells presently unaffected. The surface water objective of preventing adverse effects on aquatic organisms is being met at the treatment plant discharge point due to implementation of the remedial action and at nearby wetlands by the expansion of the ground water extraction system. The air remediation objective, of preventing chronic and acute adverse impacts on human health during implementation of ground water and soil remediation technologies, was achieved during the soil cleanup and continues throughout the ground water cleanup.

The ongoing ground water extraction and treatment system is restoring the drinking water aquifer while minimizing the spread of plume contaminants from other portions of the aquifer. Operation and maintenance has been effective so far. As discussed in Section VII, sentinel wells are recommended to determine whether the plume is being adequately contained from the lower sand aquifer of CW 3, and MPCA has begun work on this project, which is expected to be finished by the end of 2003. Evaluation of the effectiveness of the remedy will continue and modifications to the extraction system will be made as needed within the limits of the treatment capacity.

Long-term protectiveness of the ground water extraction and treatment portion of the RA will be assessed using the sentinel well data and other monitoring information. The ground water extraction and treatment portion of the remedy will be considered protective of human health and the environment upon attainment of ground water cleanup goals. Appropriate modifications will be implemented throughout this time frame as required by the system.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Long Prairie Ground Water Contamination Superfund Site

EPA ID *(from WasteLAN)*: MND980904072

Region: 5 | **State:** MN | **City/County:** Long Prairie, Todd County

SITE STATUS

NPL status: Final **Deleted** **Other (specify)**

Remediation status (choose all that apply): **Under Construction** Operating **Complete**

Multiple OUs?* YES **NO** **Construction completion date:** 9/19/1997

Has site been put into reuse? YES **NO**

REVIEW STATUS

Lead agency: **EPA** State **Tribe** **Other Federal Agency**

Author names: Maureen Johnson, Mark Elliott, Sheila Sullivan

Author title: Project Manager, Hydrogeologist, and EPA Regional Project Manager | **Author affiliation:** MPCA, MPCA, EPA

Review period:** 10 / 01 / 1997 to 9 /31 / 2002

Date(s) of site inspection: 7 /31 / 2002

Type of review: **Post-SARA** **Pre-SARA**
NPL-Removal only **NPL State/Tribe-lead**
Regional Discretion

Review number: **1 (first)** **2 (second)** **3 (third)** **Other (specify)**

Triggering action:

Actual RA On-site Construction at OU# ___ **Actual RA Start at OU# _____**
Construction Completion **Previous Five-Year Review Report**
Other (specify)

Triggering action date *(from WasteLAN)*: 9 / 19 / 1997

Due date *(five years after triggering action date)*: 9 / 30 / 2002

* "OU" refers to operable unit.
** Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.

Five-Year Review Summary Form, cont'd.

Issues:

1) Current and future protectiveness of the remedy is potentially compromised by the use of existing undocumented water supply wells located in the area of ground water contamination; particularly by new property owners who may be unaware of the ground water contamination problems and by property owners who may disregard health advisories.

Future protectiveness is affected by the remaining issues:

2) One remaining residential water supply well located near the east edge of the plume is still threatened by contamination.

3) Discovery of possible low-level *cis*-1,2-dichloroethylene (DCE) contamination in municipal supply well or City well (CW) #3 indicates a need to monitor the lower ground water aquifer, specifically between the plume and municipal water supply wells.

4) Recent detection of DCE in CW #3 may indicate possible low level DCE contamination.

5) As conditions change, ongoing maintenance and performance monitoring is needed to assure that the ground water pump and treat system continues to operate properly and efficiently.

6) Recently constructed irrigation wells that serve a new school facility, located approximately ¼ mile northeast of the current plume boundary, were identified. The pumping of these irrigation wells in the aquifer must now be considered when evaluating the plume's migration.

7) It has recently been demonstrated at other sites that 1,4-dioxane co-occurs with chlorinated solvents such as trichloroethylene (TCE) and PCE. Since this Site contains PCE and other chlorinated degradation products, such as TCE and 1,2-DCE, sampling is needed to confirm whether 1,4-dioxane is also present in the ground water.

8) The ground water plume at the Site poses a threat to aquatic life and related terrestrial organisms and habitats since some unrecovered/untreated ground water may discharge to the Long Prairie River and adjoining wetlands. Adequate monitoring is needed to assess the effectiveness of the expanded ground water extraction system and whether the plume has impacted the River water quality over the RA time period.

Recommendations and Follow-up Actions:

(numbered paragraphs below correspond to the above same numbered issues)

1) Regarding issue 1, the MPCA has requested from the City of Long Prairie an updated list of municipal water supply customers residing in the health advisory area. MPCA should conduct an updated ground water receptor survey to identify any possible new or formerly unidentified supply wells that are being used in the advisory area by 2004. Information from this survey will be used to identify and regularly inform customers in the advisory area of the ground water contamination, progress in Site remediation and relevant health information.

2) The identified threatened residential well will be added to the routine ground water monitoring program in 2002. Bottled water or carbon filtration will be offered if contamination is present.

3) By the end of 2003, the MPCA is considering the installation of a monitoring well between the plume boundary and municipal well (CW) #3, which is screened in the lower sand aquifer to detect any contaminants prior to their arrival at CW #3.

4) The drinking water standard for *cis*-1,2-DCE has not been exceeded in CW #3, however routine monitoring for DCE and other VOCs will continue.

5) MPCA's current level of maintenance and performance monitoring must continue to assure the proper and efficient operation of the ground water pump and treat system over changing conditions. The system must be evaluated and optimized to meet the ground water cleanup goals.

6) MPCA needs to obtain information concerning the new school facility irrigation wells located near the plume extraction system. This information should include such data as well construction, pumping capacity and operating frequency, which can then be used by MPCA's consultants to develop a more current and accurate Site ground water model and capture zone analysis. A more accurate assessment of the plume and capture zone considering these irrigation wells should be available by the end of 2003.

7) To ascertain the presence or absence of 1,4-dioxane, the MPCA should collect two rounds of representative samples from ground water monitoring wells, system influent and effluent by the end of 2003. Since there is currently no drinking water MCL for this compound, the EPA National Ground Water Forum has raised this concern of the potentially widespread occurrence of 1,4-dioxane in ground water that is used for potable water, to the Office of Water. Further, 1,4-dioxane has been nominated as a priority chemical for assessment in the Integrated Risk Information System (IRIS) database in FY 2003.

8) By the end of 2002, the MPCA will modify the ground water monitoring plan to include regular sampling of all nested monitoring wells that are located along the edge of the Long Prairie River and adjoining wetlands to assess potential plume discharge to the River.

Protectiveness Statements:

The remedy consists of three OU s. The Ground Water portion of the remedy (OU 1), consisting of groundwater extraction and treatment to safe drinking water standards is protective of human health and the environment in the short term. There are no current exposure pathways to the groundwater contaminants under normal circumstances, except for new residents and residents who disregard the Minnesota Department of Health (MDH) health advisories by using existing wells or installing new wells into the aquifer. The portion of the remedy that involves containment of the plume and prevention of discharge of contaminated ground water to the surface waters of the Long Prairie River and adjoining wetlands currently is functioning as planned and offers short-term protection to surface water. OU 1 will offer long-term permanent protection for future users of the aquifer and the adjacent River and wetlands once it is completed, i.e., groundwater cleanup goals are attained.

The Soil Remediation portion of the remedy (OU 2) has been completed. This portion of the remedy offers long-term permanent protection from leaching of contamination to the aquifer and from human exposure to PCE soil contamination and vapors near the source area. This portion of the remedy is protective of human health and the environment.

The portion of the groundwater remedy that involves providing an alternative water supply (OU 3) to users of the contaminated portion of the aquifer currently protects human health and the construction of new water lines to supply municipal water to nearly all properties within the advisory zone was completed in 1997. Long-term protectiveness of the remedy will be achieved upon attainment of ground water cleanup goals.

The remedy is protective of human health and the environment in the short term. There are no current exposure pathways and the remedy appears to be functioning as designed. The removal of VOCs from the soil has eliminated the source of contamination. The continued removal of extraction and treatment of ground water for VOCs has minimized migration of contaminants to ground water and surface water and is restoring the aquifer to cleanup goals. Direct ingestion of, and contact with, contaminants in soils, ground water and surface water has been prevented or minimized. Long-term protectiveness will be achieved upon attainment of the cleanup goals.

Other Comments:

None.

Long Prairie Ground Water Contamination Superfund Site
Long Prairie, Minnesota
First Five-Year Review Report

I. Introduction

The purpose of this five-year review of the Long Prairie Ground Water Contamination Site (Site) is to determine whether the remedy at this Site is protective of human health and the environment. The implementation and performance of the remedy was evaluated during this five-year review. The methods, findings and conclusions based on data and observations are documented in this five-year review report. In addition, this Report identifies issues which surfaced during the review process and recommendations for resolving these issues.

In cooperation with the U.S. Environmental Protection Agency (EPA), Region 5, the Minnesota Pollution Control Agency (MPCA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section (104) or(106), the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) which states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Further, the EPA has determined in policy that sites requiring more than five years to achieve unlimited use and unrestricted exposure, should also be subject to five year reviews. This Site is characterized by contaminants in the ground water which exceed health-based limits, thereby preventing unlimited use of and unrestricted exposure to the Site. The remediation time frame for the ground water is expected to exceed five years. Hence, this Site is being Reviewed as a matter of Policy.

The designated MPCA State Project Manager (SPM) and hydrogeologist, with the assistance of the EPA Regional Project Manager (RPM) for the Site, conducted the five-year review of the Site remedy during the time period from September 1997 through August 2002. This report documents the results of the review. Barr Engineering Company (Barr), MPCA's technical consultant for the Site since the remedial design (RD), has provided annual ground water analyses to support this review. The Site inspection was conducted on July 31, 2000 by MPCA staff, Barr, and the RPM.

This is the first five-year review for the Site. The triggering action for this policy review is the RA construction completion of September 1997, as documented by the PCOR in September 1997. The five-year review is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure until the remedy meets cleanup levels.

The Site contamination was caused by the improper disposal of the dry-cleaning solvent PCE on the immediate property of the dry-cleaning facility. The Site consists of three operable units (OUs) addressing the soil and ground water contamination.

1. OU 1 is to address ground water contamination by extraction of ground water through a nine-well recovery network. The ground water is subsequently treated by a granular activated carbon (GAC) system. The system construction was completed and determined to be operational and functional in August 1977. The Long Term Response Action (LTRA) is expected to continue until September 2007. At this time, Operation and Maintenance (O&M) by the State will continue until the cleanup criteria and requirements stated in the ROD and ESDs are met.

2. OU 2 is to address the significant volume of PCE in the source area soils. This was achieved through a Soil Vapor Extraction (SVE) System, which removed PCE from the soils from the time its installation was completed in June 1997 until the system was demobilized in March 2000.

3. OU 3 functioned to interrupt the potential exposure pathways to contaminated ground water by providing an Alternate Water Supply to residents with contaminated wells or who were determined to be at risk by the MDH. The Municipal Water Hookups were provided in 1996.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date	
Dry cleaner operation in operation until 1984		1949
MDH discovers PCE contamination in two of the five Long Prairie municipal water supply wells		1983
MDH issues Health Advisory for residential wells in 15 block area of City; in 1994 advisory expanded to include additional 5 block area		1983
Bottled water provided to affected residents		1983
GAC treatment installed for the two affected municipal wells		1984
State Requests for Information	October	1983
Federal HUD grant for new municipal well, mains, water treatment plant improvements		1984
Cooperative Agreement with multiple amendments	September	1984
Proposed NPL listing	November 15	1984
State Depositions	April 24	1985
State Notice to PRPs to do RI/FS	May 25	1985
NPL listing	June 10	1986
Remedial Investigation/Feasibility Study complete	April 4	1988
State/EPA Notice to PRPs to reimburse past, future	April to May	1988
ROD signature. ROD objectives were to provide safe water supply for current and future users of the Long Prairie aquifer and prevent the spread of contaminated ground water to unimpacted wells.	June 27	1988
Remedial design start	September 19	1988
Remedial design complete	April 11	1991
Actual remedial action start	April 11	1991
First ESD signed to change the treatment of recovered ground water from air-stripping to GAC.	June 20	1991
Second ESD signed to clarify RAOs and cleanup goals.	May 31	1994
Construction OU 1, subsurface OU2 start	January 26	1995
Construction OU 2, above ground start	January 26	1995
Superfund State Contract signed	June	1996
Construction OU 3, municipal water hookup start	November	1996

Interim RA Close-Out Report OU 3 approved	February	1997
Construction OU 2, above ground complete	April 23	1997
Construction OU 3, municipal water hookup complete	May	1997
Construction OU 1, subsurface OU 2 complete	August 14	1997
Construction completion date	September 19	1997
OU 2, Partial Remedial Action Completion Report	August	2000
OU 2, Soil Vapor Extraction Demobilizaton Complete	March	2000
Construction Documentation Report, Conveyance System	October	2000
Five-Year Review Site Inspection	July 31	2002

III. Background

Physical Characteristics

The Long Prairie Groundwater Contamination Site is a 0.16-acre (about 7,000 square feet) area of contaminated soil located in back of a now defunct dry-cleaning facility. The facility was located at 243 Central Street, in the commercial district of Long Prairie, Minnesota. The contaminated soil area served as a continuous source of contamination to the ground water aquifer underlying the City of Long Prairie and the surrounding region. As a result of the contamination emanating from the facility, a contaminant plume formed within the aquifer beneath the City's commercial district and spread through an older residential area. The Long Prairie River flows through the City and passes within about 500 feet of the plume. The City is situated at an elevation of about 1,300 feet on the sand and gravel of the Long Prairie Sand Plain, which is a long narrow glacial outwash plain. The plain is recharged by precipitation and inflow from the Long Prairie River. Generally, ground water flow is to the north-northeast, unless locally influenced by pumping. Groundwater that is not withdrawn via production or recovery wells eventually discharges to the Long Prairie River.

Land and Resource Use

The City of Long Prairie is the County Seat of Todd County in central Minnesota, about 120 miles northwest of Minneapolis/ St. Paul. Long Prairie is a small farming community. Land use in the vicinity of the Site includes light industry and commercial establishments in downtown Long Prairie. The remainder of the City is residential. Land use outside the City is agricultural, and is not expected to change significantly in the future, although the City has had some more recent success in attracting small industries, such as a rendering plant, food manufacturing and aluminum milling. The City obtains its potable water supply from the ground water of the Long Prairie Sand Plain aquifer underlying the City and the surrounding region. The municipal water supply system currently consists of two wells in the area of concern and other wells which serve a City population of slightly less than 3,000 persons. Only a few of the residents still use private wells, having refused connection to the municipal water mains.

History of Contamination

The source of ground water contamination at Long Prairie was a dry-cleaning facility located at 243 Central Street in the commercial area of the City. The business changed ownership three times during the course of its operation from about 1949 to mid -1984. According to supply records, during the time period from 1978 to 1984, about 2,200 gallons of the dry cleaning solvent tetrachloroethylene, also known as perchloroethylene or PCE, were used in the dry-cleaning operation. The PCE wastes from the process were subsequently disposed in a makeshift french drain, i.e., a barrel with holes in the bottom that was sunken in the ground up to its rim, in the back lot of the facility. Since 1983, an old, unused incinerator of unknown purpose also exists near the original location of the french drain.

The contamination was discovered during a national initiative by EPA in conjunction with the State Public Water Supply agencies, i.e, the MDH, to investigate the occurrence of synthetic volatile organic chemicals in public water supplies supplied by ground water sources. During this initiative, two of the five City ground water supply wells (CW #4, CW# 5) were found to contain PCE, trichloroethylene (TCE) and *cis*-1,2-dichloroethylene (DCE). Further, eight of the 21 residential wells sampled around these wells were also contaminated with PCE. Because these chemicals, which were known or suspected carcinogens, exceeded Maximum Contaminant levels (MCLs) or other risk-based levels, the MDH recommended that the City wells be removed from service. A drinking water advisory was issued for the 15-block area of northeastern Long Prairie.

Initial Response

The MPCA issued a Determination of Emergency to provide drinking water for residents in the advisory area. At that time, about 350 private residential wells in the area were in use except for drinking water provided by Minnesota National Guard with buffalo tanks. An activated carbon treatment system was subsequently installed on CW #4 and #5 from June to October 1984 to eliminate the need for provided drinking water. In May 1984, a Housing and Urban Development (HUD) grant was awarded to the City to install a new municipal supply well (CW #6). CW #4 and #5 were retired at that time. The grant also funded the installation of water transmission lines and improvements to the municipal water treatment plant. In addition to the sixteen existing monitoring wells installed during earlier Site activities, another fifteen monitoring wells were installed at eight locations in Long Prairie in February 1984. The results from these wells and other private wells determined that the plume length extended 2,100 feet northeast from the source and 1,000 feet across. Because the enforcement activities conducted between 1983-1988 did not result in any viable PRPs to undertake response actions, a Multi-Site Cooperative Agreement (MSCA) was signed on September 4, 1984 between MPCA and EPA, to implement a Remedial Investigation and Feasibility Study (RI/FS) at the Site.

Basis for Taking Action

Contaminants

Hazardous substances that have been released at the Site in each media include:

Groundwater	**Soil**
Tetrachloroethylene	Tetrachloroethylene
1,1,2-Trichloroethylene	1,1,2-Trichloroethylene
cis-1,2-Dichloroethylene	*trans*-1,2-Dichloroethylene
	1,1,1-Trichloroethane

In 1983, ground water contaminated with PCE, 1,1,2-TCE, *cis*-1,2-DCE and a small amount of vinyl chloride, was discovered in two of Long Prairie's municipal wells as a result of a VOC sampling initiative. The elongated plume appeared to extend throughout the saturated depth of the sand aquifer underneath the City, and contained an estimated 7 million gallons of contaminated ground water. Further, investigation of the soils in the back lot of the dry-cleaning facility, identified as the probable main source of the contamination, showed high concentrations of PCE, TCE, *trans*-1,2-DCE and 1,1,1-trichloroethane. The Toxic Characteristic Leaching Potential (TCLP) of these contaminated soils indicated that they would act as a continuous source of ground water contamination, if not remediated.

The actual and potential threats to human health at that time were chiefly due to normal potable water use exposures, such as ingestion, dermal contact and inhalation of volatile vapors from contaminated water. The exposure pathway presenting the highest carcinogenic risk was the ingestion of contaminated ground water. Contaminated soils also posed a risk due to dermal contact. EPA proposed the Site to the NPL on October 15, 1984. The Site, with a Hazard Ranking System (HRS) score of 32, was added to the final NPL on June 10, 1986.

The Potential Responsible Parties were sent enforcement documents prior to the RI/FS and the Remedial Design and Remedial Action (RD/RA), and were determined to have limited financial resources or to be deceased. Consequently, the RI/FS and RD/RA were conducted under the previously mentioned MSCA.

IV. Remedial Actions

Remedy Selection

On June 14, 1988, the EPA Regional Administrator signed a Record of Decision (ROD) for the Site. The ROD did not state Remedial Action Objectives (RAOs) as such, however in the Declaration, the summary description of the selected remedy includes remedial objectives. Further, the two ESDs that were signed subsequent to the ROD clarified the cleanup objectives. Hence, the media-specific RAOs for the Long Prairie Site are as follows:

Groundwater

- To provide a safe drinking water supply for present and future users of the Long Prairie Sand Plain aquifer;
- To prevent the spread of contaminated ground water to wells presently unaffected, including the City of Long Prairie municipal supply well #6.

Soil

- To prevent future impact on drinking water due to leaching migration of contaminants from soils to ground water;
- To prevent ingestion / contact with contaminated soils.

Air and surface water

- To prevent chronic and acute adverse impacts on human health during implementation of ground water and soil remedial technologies;
- To prevent adverse effect on aquatic organisms due to implementation of remedial action.

Thus, to protect public health and the environment and provide a safe drinking water supply for the present and future users of the Long Prairie Sand Plain aquifer, the remedy included the goal of restoring the ground water aquifer by reducing the major contaminant (PCE) to a health-based concentration of 5 ug/L or less; providing an alternate water supply to persons using the contaminated portions of the aquifer; mitigating the soils at the source of the plume to 1,200 ug/kg PCE to maintain an acceptable ($< 1x10^{-6}$) ground water risk level due to PCE. leaching from the source soils . In order to prevent the spread of contaminated ground water to wells presently unaffected, including the City of Long Prairie Wells # 3 and more recently, CW # 6, it was acknowledged that the ground water remediation system may need to continue operating, despite the possibility that restoration of the ground water aquifer to a PCE concentration of 5 ug/L was not attainable, in order to contain the plume.

The selected remedy consisted of the following significant components:

- Install ground water extraction wells in the contamination plume;
- Treat contaminated ground water with an air stripper;
- Discharge treated ground water from the air stripper to the Long Prairie River;
- Treat contaminated soil with an active soil venting system.

The ROD specified cleanup levels (also referred to as Target Cleanup Levels or cleanup goals) for soils and ground water. For ground water, the ROD specified aquifer restoration to the drinking water MCL, which is 5 micrograms per liter (ug/L) PCE, and with a treated water discharge concentration maximum of 5 ug/L for PCE. The ROD specified treatment of the soils to 1,200 ug/kilogram (kg). The ROD also noted that if the Target Cleanup Level for PCE is not achievable, as indicated by such asymptotic curves on the aquifer condition or scientifically defensible data analysis from regular ground water monitoring, the ROD provides for the consideration of alternate concentration levels (ACLs). Adoption of ACLs will require a justification document before the ground water extraction and treatment system is discontinued.

In addressing PCE contamination, the ROD concluded that other degradation products of PCE would also be remediated at the same time. The cleanup level of 5 ug/l PCE is derived, as described in the ROD and ESDs, from various applicable or relevant and appropriate requirements (ARARs). These ARARs included the most protective criteria for both humans, i.e., the MCL of 5 ug/L for PCE, and aquatic life, i.e., the National Pollutant Discharge Elimination System (NPDES) permit requirements for PCE. All potential contaminants in the discharge must also meet NPDES requirements. The cleanup levels are applicable to both restoring the aquifer and the GAC treatment system discharge.

On June 13, 1991, the Regional Administrator signed an ESD to support the use of granular activated carbon (GAC) units in place of the air stripping for treatment of contaminated ground water, as prescribed by the ROD. This modification would necessitate an additional estimated $330,000 to the cost. The 1991 ESD also restated the cleanup goal in the ROD as 5 ug/l for PCE.

On May 25, 1994, the Regional Administrator signed a second ESD documenting the necessity for regular ground water monitoring and the provision for additional alternate water supply via water mains and service connections to the municipal water lines. This ESD also restated the two 1988 ROD objectives for ground water. The addition of ground water monitoring and service connections to the City water supply was estimated to increase the RA cost by $152,000.

With the change in technology from air stripping to GAC, and with the determination that the SVE system did not require GAC filtering of the air, the air remediation objective was achieved.

The cleanup level of the soils at the source of the plume was 1,200 ug/kg PCE. The soils cleanup specifications in the 1994 remediation construction contract for the soil venting system called for PCE removal from soil to meet a soil concentration level equivalent to a sample verification level of 640 ug/kg. This lower level is to account for documented loss of volatiles during sampling and analysis of soils. This cleanup level was achieved.

In 1998, plume sampling indicated the presence of potential risks to adjacent wetlands and possibly the Long Prairie River. This finding resulted in an additional component of the surface water objective- - to comply with current environmental criteria applicable to the plume expansion.

Remedy Implementation

The State performed the RD/RA for the Site. The RD was conducted in conformance with the approved ROD as modified by the two ESDs. The RD was completed on April 11, 1991. The RA was formally initiated on April 8, 1991 with the award of the RA amendment to the MSCA for preparation of the bid package and RA implementation. A failure to receive bids during 1993 was likely due to response action contractors' reaction to EPA's new policy toward indemnification. The construction work was separated into OU 1 for ground water and OU 2 for soils. The EPA provided indemnification for the response action contractor(s) for OU 1 and OU 2 construction. The Notice to Proceed for OU 1 was issued to the construction contractor on March 21, 1995.

Ground Water System – OU 1

The OU 1 ground water recovery system consists of the original seven extraction or recovery wells and an additional two added in 2000, ground water pumps, and raw water piping. The primary goal of this system was to restore the aquifer to 5 ppb or less of PCE and to prevent the spread of contamination to clean wells, particularly CW #3 and #6. A second goal of the three recovery wells located in the back lot of the dry-cleaning facility was to decrease the water table elevation to achieve more effective removal of soil contamination via the SVE system.

The remediation contractor conducted remedial activities as planned and modified by supplemental agreements. EPA concurred on Supplemental Agreement #5, to increase the size of the plant and appurtenances to control the plume with greater accuracy, particularly since the expanding plume was approaching CW #6. Supplemental agreements saved time and costs by constructing the underground portion of OU 2 for soils at the same time as the installation of the OU 1 recovery wells and piping in the source area was being performed. Three small buried tanks were discovered and removed during installation of subsurface vapor extraction piping. The contents were removed, containerized, identified to be of solvent and petroleum origin, and properly disposed. No additional areas of contamination were identified for remediation by the construction contractor.

In late 1993, precautionary follow up sampling of residential wells in the path of the plume resulted in the extension of the Health Advisory Area by the MDH and a determination that an alternate water supply operable unit (OU 3) with EPA/MPCA funding was required. Emergency connections to existing water mains were completed for five residents. Other residents were also connected to existing water mains. The construction contractor for the water main extensions conducted remedial activities as planned, connecting the remaining residents to the municipal water supply in fall of 1996, and completing pavement replacement and landscape restoration in spring of 1997.

The Final Inspection for the OU 1 ground water remediation and the subsurface OU 2 SVE system was conducted on November 18, 1996, at which time the State's consultant determined that all items of construction were complete. The EPA and the State determined that the following RA activities were completed according to the ROD design specifications:

- Pursuant to the ROD, ground water extraction wells were installed in the contamination plume. Seven new ground water extraction wells included Recovery Wells 1A, 1B, and 1C in the source area. Recovery Wells 3, 4, 6, and 7 were installed in the contamination plume. The closed municipal well #5 in the plume was retrofitted to become Recovery Well 5 in the ground water extraction plan. In 2000, Recovery Wells 8 and 9 were added to protect the adjacent wetland and the River.

- Pursuant to the ESD of June 13, 1991, GAC units were substituted for the air stripping system to treat the recovered ground water prior to discharge to the Long Prairie River. Two

GAC units were constructed and are currently operating. The GAC water treatment system is designed and constructed to achieve the Target Cleanup Level in the ROD for ground water remediation of 5 ug/l for PCE. No further design detail was given in the ESD.

Although Alternative 3A of the ROD, Activated Carbon Adsorption, was not referenced as the guide for the ESD-specified GAC units, the following comparison can be made. The Site is defined as that portion of Long Prairie where soil and ground water contamination exist due to improper disposal of dry cleaning solvent. Hence, the extraction portion of the treatment system is on-site, and the connecting pipeline and GAC treatment plant are located off-site - - adjacent to the City's former wastewater treatment plant in the northwest part of town near the Long Prairie River. This location afforded adequate operating space and access from the City. Thermal destruction of contaminants is achieved off-site, during the carbon regeneration process. An equalization tank was not constructed for raw water; instead, each recovery well is individually regulated and manifolded to the influent line for the GAC units. Operating flexibility and compensation for maintenance down-time, originally to be provided by the equalization tank, is instead provided by a backwash storage tank. The backwash water can be metered out from the storage tank at a rate and volume acceptable to the City's wastewater treatment plant. The efficiency of contaminant removal by the GAC units during the first half of 1997 was evaluated from the comparison of influent to effluent concentrations as follows:

Summary of Contaminant Removal Efficiency via GAC in 1997

Contaminant	Mean Influent Conc. (ppb)	Effluent Conc. Range (ppb)
PCE	700	72 - 100
TCE	200	10 - 14
DCE	30	8.4 -12

A flow rate greater than 250 gallons per minute (GPM) was achieved during the most recent quarter only after the pipes were cleaned out; the pigging process is necessary due to the interference caused by iron precipitate and bacteria. The need for sedimentation filters, more frequent carbon changeout and the frequency of pigging is continually evaluated to maximize the pumping and contaminant removal efficiency.

At a detection level of 1 ppb, vinyl chloride has not been detected in the GAC unit influent and effluent analyses. Vinyl chloride was detected only once, in the most highly contaminated well. This detection has not been verified. The 1994 and 1995 ground water sampling rounds did not detect vinyl chloride at a minimum detection level of 0.5 ppb. Vinyl chloride has not been listed as a contaminant of concern; hence, the concern identified in the ROD that vinyl chloride may not be sufficiently removed by GAC is not relevant.

- Pursuant to the ROD, the treated ground water is discharged to the Long Prairie River.

The State's consultant engineer began pumping and treating the contaminated ground water via GAC and continued for the one-year shakedown period. Pumping and treating has and will continue under EPA and State funding for ten years. If continued operation of the pump and treat system is feasible, the State will continue its operation until the Target Cleanup Level is met or an ACL is established.

Soil Vapor Extraction System - OU 2

The SVE system was installed in two phases. In 1995 the subsurface portion of the SVE, consisting of vent wells, piping and monitoring points, were installed at the same time as the three ground water recovery wells in the back lot area to minimize disruption of local businesses and to economize costs. The above-ground piping, remediation equipment and enclosures were installed in July 1997. The system was deemed operational and functional according to its RD requirements and achieved the ROD Target Cleanup Levels for PCE in soil 1,200 ppb, in less than three years (projected one to five years) for the vadose zone soils (soils above the water table). The estimated volume of unsaturated contaminated soil in the back lot area was 37,500 cubic feet. The installed active soil venting system, prescribed by the ROD, aerates contaminated soils by forcing a subsurface airflow with vacuum extraction. The volatile organic contaminants are stripped from the soils. The system consisted of three vadose zone monitoring points or air withdrawal wells installed in the back lot area around the SVE system that are constructed similar to recovery wells screened above the water table. Nine soil vapor extraction vent wells were constructed above the table with configured piping to allow for control of the airflow. This is illustrated in the schematic of the soil venting process (see ROD, Fig. 5). The system as installed is less complex than envisioned by the ROD.

The modifications to the SVE system involved the approach to the air injection, which is documented in the RD records. The vacuum blower equipment was installed to draw air into the system instead of exhausting air. The system was designed to aid in lowering the water table by pumping the three recovery wells as much as possible to expose the maximum volume of soils for remediation. This potential was evaluated during the RD and incorporated into the final design. Later it was recognized that lowering the water table to the maximum degree could affect the old building foundations, hence levels were adjusted in consideration of this information. Further, it determined that the system would not require GAC treatment of the vented soil vapors.

EPA and the State conducted a Pre-Final Inspection of the subsurface portion of the SVE OU 2 on May 9, 1996, in conjunction with the OU 1 Pre-Final Inspection, as described above. The OU 2 construction contractor performed above ground SVE remedial activities in 1997 as planned.

EPA and the State conducted a Pre-Final Inspection of the surface portion of the SVE OU 2 on September 4, 1997 and determined that one construction item, security for the valves, required an evaluation as to whether the contract required the item to be completed by the contractor. On September 12, 1997, the State requested concurrence from the Engineer on its interpretation of the contract and recommended that the Engineer estimate the cost of the item, negotiate a resolution for the item with the contractor, and provide a correction schedule. Remaining commitments from the contractor are use of the equipment for eight months and demobilization. Unit prices for lease of equipment after eight months are in the contract if the cleanup has not met the cleanup goals by the end of the use period, April 23, 1998.

On behalf of the State, Barr began pilot testing of the SVE on the substantial completion date, July 23, 1997, to determine whether the emissions required vapor phase GAC treatment. Barr determined that GAC treatment of the vented soil vapor was not necessary. Barr operated the active venting system to remediate the contaminated soils until the Target Cleanup Level for PCE was achieved. EPA and the State determined that the following RA construction activities were completed according to the ROD design specifications:

Alternate Water Supply - OU 3

EPA and the State conducted a Pre-Final Inspection of the water main extensions and remaining connections construction of OU3 on September 4, 1997, which determined there were no remaining construction items to be completed by the contractor. EPA and the State determined that the following RA activities were completed according to the ROD design specifications:

- Construction of alternate water supply, including water main extensions, in the expanded health advisory area; and

- Complete the provision of an alternate water supply by installing service connections to the municipal water supply for the remaining residences using private wells.

The sample results from drinking water collected from the extensions were received on November 22, 1996 and found to be satisfactory. The City initiated and continues to provide municipal water to the residents via their regular water supply services. On September 4, 1997, the City Administrator David Venekamp and Public Works Director Pat Meyer indicated, on behalf of the City of Long Prairie, their satisfaction with the water main extensions and verified that the constructed facility is functioning as designed. The Joint EPA/State Pre-Final Inspection

for OU 3 water main extensions and connections also functioned as the Final Inspection since no construction items remained. The PCOR was completed in February 1997. The Site-wide construction completion was achieved on September 19, 1997 as documented by the Final RA Report for the ground water remediation.

The Operational and Functional Period occurred from August 14, 1996 to August 13, 1997. MPCA's contractor, Barr, managed the O&M and the project during this time. A major problem involving iron precipitation build-up in pumps and lines was resolved through a rigorous cleaning and maintenance schedule for the pumps and water lines. With regular maintenance to control iron precipitation, the system can recover ground water at the design rate of 250 GPM. Ground water is treated to levels that meet discharge standards. Ancillary equipment operated satisfactorily. Ground water modeling indicated that the recovery system was achieving the designed capture zone, however, ground water monitoring indicated that the contaminant plume extended beyond the design capture zone.

System Operations/Operation and Maintenance

The ground water extraction and treatment system is managed pursuant to the Operations and Maintenance (O&M) Plan. This Plan is modified as recommendations provided by Barr in the approved annual reports. Monitoring includes modeling and tracking the control and remediation of the plume. Periodic adjustments and modifications to the ground water system are made during the ten-year Long Term Response to maintain optimum performance based on the monitoring clarified in the second ESD.

Primary activities of the O&M Plan include:

- Operation of the treatment plant 24 hours per day, seven days per week. Water is treated from all active extraction wells and discharged;
- Inspection and maintenance of ground water extraction and monitoring wells;
- Operation of the SVE system 24 hours per day, seven days per week with biweekly or monthly system inspections.

The purpose of the Site O&M Monitoring Plan is to gather sufficient information to determine the status and effectiveness of the implemented RA, which consisted of both the ground water recovery and treatment system and the soil vapor extraction system. The data collection objectives are:

1. Collect and analyze off-gas samples on a quarterly basis from the SVE system during operation to monitor and document the extraction of volatilized contaminants from soil.

2. Monitor water quality from the discharge of the GAC system to determine compliance with the RA Plan and the NPDES discharge permits for the discharge to the Long Prairie River and for the backwash to the local sewer.

3. Monitor water quality at the specified ground water monitoring points (monitoring wells, city wells and recovery wells) to evaluate system performance and to confirm protection of the City water supply wells.

4. Test the GAC carbon to determine spent carbon toxicity characteristics.

Sampling includes the seven recovery wells, all existing monitoring wells, and the discharge point on appropriate schedules. Water level measurements are measured quarterly. Weekly pumping rates are measured and reported monthly pursuant to the Minnesota Department of Natural Resources appropriation permit.

A typical quarterly monitoring report includes:

1) documentation of activities conducted during the reporting period, including:
   a) monthly monitoring of the system,
   b) quarterly monitoring of the active recovery wells, selected monitoring wells, City well(s) and water levels
   c) comparison of data with historical data
   d) weekly meter readings, flow rate data from the recovery wells
   e) backwashing events
   f) field data and lab reports
2) monitoring activities scheduled for the next quarter
3) summary of maintenance and repair activities conducted
4) maintenance and repair scheduled for the next quarter
5) overall system performance discussion on the treatment system and pumpout flow rates
6) supporting data.

The major O&M problems encountered at the Site for the ground water OU 1 are described in the following paragraphs.

- Early in the O&M period, the spent carbon was categorically defined as non-hazardous, pursuant to memoranda from the State RCRA program. Spent carbon was expected to be generated about every four months, and was analyzed by the TCLP procedure. Regeneration of the spent carbon was expected to result in the thermal destruction of any absorbed VOCs. In 1999, the spent carbon was determined to be a listed RCRA hazardous waste, classification F002. The MPCA selected regeneration as a treatment or disposal method, and the appropriate bidding process ensued for selection of a subcontractor for management and

regeneration of the spent carbon. A RCRA Emergency Preparedness and Contingency Plan was prepared in October 1999.

- High iron precipitation or iron bacteria fouling is managed by cleaning the lines regularly with pigging, i.e., introducing a soft plastic or foam into the line. As the pig is pushed along by water pressure from the well, it abrades the iron that is also carried along by water pressure. The iron in the raw water is removed in the lead GAC vessel. The iron causes an increased head loss, which is controlled by regular backwashing of the lead vessel. The backwash is discharged to the local sewer system by permit. If these maintenance activities become less effective, another method of iron control may be required.

- In 1998, RW 5 (an inactive City well that was refurbished for use as a recovery well) was introducing air into the system. It was temporarily removed from service for screen maintenance.

- The Long Prairie River Stewardship group expressed concern about the low oxygen levels in the discharge to the River during periods of lower flow. Although no effect was observable in the River, this concern was addressed by documenting the presence of air in the piping from the plant to the discharge point. As a result, the monitoring plan was revised to include the analysis for dissolved oxygen in the River.

- During the first year of O&M (early 1999), an investigation of the plume outside the capture zone defined: the nature and extent of the escaping plume; the location of potential receptors and their respective risks; the potential response action including adding a recovery well(s); the potential response action against the system capacity; ground water modeling; and, expansion of the ground water modeling network. As a result, two additional recovery wells (RW8 and RW9) and additional monitoring wells were added to the system in late 1999, and related activities were added to the O&M and monitoring plans.

- During the most recent five years, occasional wells in the drinking water advisory area have been reported; abandonment is offered and provided if access is given. Several private wells and a City irrigation well have been abandoned.

Of relevance to OU 1 is the recent initiative by EPA to determine how to improve the efficiency and effectiveness of ground water pump and treat systems at Superfund sites. This national effort, known as the "Hydraulic Optimization Demonstration Project", is directed by EPA's Technology Innovation Office (TIO). The project goals are: to identify cost savings through changes in operation and technology; to evaluate performance and protectiveness (as required by the NCP and five-year reviews); to assure clear and realistic remediation goals and exit strategies; and, to verify adequate maintenance of Government-owned equipment. In Spring 2000, a national pilot study began which evaluated and made recommendations for improving the operation of two Region 5 ground water pump and treat systems. TIO will eventually assess all Superfund pump and treat systems. The Long Prairie Site was also considered at the time for

the pilot study but was not selected. In September 2002, TIO expressed interest to the RPM of incorporating the Long Prairie Site into this optimization study. The EPA and MPCA Site personnel will continue to participate in conference calls and to provide Site information and electronic data as requested by TIO and its contractors.

Soil Vapor Extraction System - OU 2

After pilot testing of the system from July 25, 1997 - August 8, 1997 and on September 16, 1997. The system began full-scale operation in late September 1997. Periodic adjustments and modifications to the soils system operations were made during RA to maximize the PCE vapor extraction. Soil borings were collected and testing was conducted to determine the progress of soil remediation. This soil gas removal technology usually demonstrates rapid contaminant removal rates early in the operating cycle, when the majority of the contaminant mass is in the gaseous phase in the soil pore space. Once this mass is removed, the rate of additional contaminant removal is limited by the rate at which the additional contaminants volatilize from the soil, and is marked by a sharp decline in removal rate. When the system was recovering only parts per billion levels of PCE in the soil gas, the system was shut off from December 1998-April 1999. The system was monitored to determine whether additional contaminants had volatilized to the pore space. After confirmation that the ROD Target Cleanup Level had been met, the system was shut down in March 2000 and decommissioned in April 2000. A partial Remedial Action Completion Report was approved in August 2001. The total estimated mass of contaminant removed during operation of the SVE system was estimated to be 385 kg of which the majority was PCE, with lesser amounts of TCE and DCE.

Alternate Water Supply - OU 3

The City is using the water main extensions as intended and has assumed responsibility for their maintenance. The OU 3 continues to perform as per the objectives in the ROD, however the following exceptions exist:

- One resident in the health advisory area still uses a private well. This is because the residence was located a significant distance from the water main and not within or near the plume boundary during the 1985 implementation of the alternate water supply. This property was therefore not connected to the City water main. This private water supply must be periodically monitored.

- One resident has a municipal water supply connection that has sustained damage during a winter freeze due to the shallow elevation of the existing older City-installed water main. The resident has chosen to reinstall a private well for drinking water rather than repair the connection. This residence should be monitored for changes in ownership to assure future residents are fully informed of the potential risks from ground water.

- A business, which was not able to connect to the water main, has been using bottled water. This facility should be periodically checked to ensure that the existing well is not used for drinking water.

O&M Costs

The June 1988 ROD estimated the total O&M cost of ground water extraction with GAC treatment OU 1 to be $300,000 per year, for five years. Remedial design modeling indicated the system would need to operate for at least 15 years to achieve cleanup goals. The ROD also estimated the OU 2 SVES annual O&M costs to be $140,000 per year, for 3 years.

MPCA's actual annual O&M costs for both the ground water extraction and treatment system and the SVE system, prior to and during the five-year review period, are detailed in Table 2 - Annual System Operations and O&M costs. The State fiscal year cycle is from July 1 through June 30, the annual cost basis. Construction contractor costs are not included in Table 2. The fiscal year ending June 30, 2000 the consultant contractual costs also include oversight of construction of additional RWs, which was not separable. Invoices for work prior to July 1, 2002 were still being processed as of August 30, 2002, thus, the annual cost for FY end is incomplete.

The SVES OU 2 operated for 2.5 years. During the first year of the RA, the total O&M cost for the ground water extraction/treatment system and the soil vapor extraction system was $326,000. The total actual cost was significantly less than the total O&M estimate of $440,000.

The year ending June 30, 2001, $219,000 is a typical figure for annual O&M for the ground water extraction and treatment system OU 1.

Table 2: Annual System Operations and O&M Costs

Dates		Total Cost (Rounded to nearest $ 1,000)	
From	**To**		
7/1/97	6/30/98	$ 326,000.00	(includes O&M of OU 1 and OU 2)
7/1/98	6/30/99	$ 295,000.00	(includes O&M of OU 1 and OU 2)
7/1/99	6/30/00	$ 344,000.00	(includes O&M of OU 1 and O&M of OU 2 for ½ year, and oversight of RW construction)
7/1/00	6/30/01	$ 219,000.00	(includes O&M of OU 1)
7/1/01	6/30/02	$ 188,000.00	(incomplete)
Total Cost		$1,372,000.00	(estimated)

The following is a breakdown of the annual O&M costs for the ground water extraction and treatment system from July 1, 2000 to June 30, 2001:

O&M Services	**Annual Costs**
Consultant (Barr)	$ 204,226.00
Other	$ 2,173.00
MPCA oversight	$ 12,135.00
Total	**$ 218,533**

The current total annual expenses, which are anticipated to be typical of annual expenses, are well under the ROD estimate of $300,000 per year for ground water GAC treatment.

V. Progress Since the Last Review

This is the first five-year review for this Site.

VI. Five-Year Review Process

Administrative Components

Potentially interested parties, including the MPCA and EPA management and staff counterparts were notified of the start of five-year review. The members of the review team included:

Maureen Johnson, Project Manager, MPCA

Mark Elliott, Hydrogeologist, MPCA

Steve Hennes, Environmental Risk Assessor, MPCA

Stephen Mikkelson, Information Officer, MPCA

Jim Kelly, MDH

Sheila Sullivan, USEPA Remedial Project Manager, Human Health Risk Assessor

Eric Gabrielson, Barr Engineering Company, MPCA consultant

A review schedule was developed to address the following components of the five-year review from February through August 2002:

- Community Involvement
- Document review
- Data Review
- Interviews
- Site Inspection
- Five-Year Review Report Development
- Five-Year Review Report Reviews

Community Notification and Involvement

Efforts to involve the community of Long Prairie in the five-year review process and related activities were initiated in February 2002. The community was notified of the five-year review by a mailing to concerned parties and stakeholders and a news release.

The mailing to interested parties utilized an updated mailing list. Natural resource trustees, however, were not included in the notification since there are no viable PRPs. The mailing contained the EPA fact sheet ***"Focus on Five-Year Reviews and Involving the Community"***, and a news release. The mailed letter and the news release are included as Attachment 2 - Community Notification.

The MPCA website and the other public websites were reviewed for current information. An updated Site fact sheet describing the remedial actions is also located at the EPA website: www.epa.gov/region5/superfund. This information was provided in the mailings.

No comments or inquiries were received from the public or other agencies.

Information about the completion of the five-year review in September 2002 will be made available in October 2002 via a website notice, a notice to the updated mailing list and a news release. The notice of completion of the five-year review will show the site name, location and web address, describe the selected remedy and remedial actions, summarize contamination addressed by the selected remedy as provided in the initial notice, summarize the results of the five-year review; provide the protectiveness statements, give a brief summary of data and information that provided the basis for determining protectiveness, discuss issues, recommendations and follow-up actions, the date for the next review, and how to obtain or view a copy of the report. The five-year review will be available at the local Administrative Record at the MPCA offices in St. Paul, MN, the Administrative Record at the Region 5 office in Chicago, IL, and the local Site Information Repository at the Long Prairie City Hall. EPA also intends to make the report available on the EPA Region 5 website.

Because of information provided by City officials regarding the increasing proportion of Hispanic residents, future community announcements regarding the Site will be also be provided in Spanish.

Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data (See Attachment 3). Applicable ground water cleanup standards, as listed in the 1988 ROD were also reviewed.

Data Review

Groundwater Monitoring

Ground water data were reviewed since the completion of RA construction in 1997. Soil data were reviewed from construction to the demobilization of the SVE system in April 2000. Please refer to Section VII - Technical Assessment for this five-year review for a more detailed discussion, and Attachment 2 for a complete listing of documents reviewed. Further detailed information can be found by consulting the Barr 2000-2001 Annual Report (Barr, April, 2002) Appendix D (graph of VOC concentration versus time).

Site Inspections

A Site inspection was conducted on July 31, 2002 by MPCA Project Manager, Maureen Johnson, MPCA Hydrogeologist Mark Elliott, EPA RPM Sheila Sullivan and MPCA consultants Eric Gabrielson and Eric Gohl, Barr Engineering. The purpose of the inspection was to assess

the protectiveness of the remedy portion operating at the Site under Long-Term Response. The details of the inspection are provided in the Attachment 4 - Five-Year Review Site Inspection Checklist, Supplement to the Checklist, and Photographs. The site length was walked from the source to the farthest recovery well.

Interviews

Interviews were conducted with various parties connected with the Site. These interviews are included in the Five-Year Review Inspection Report as Attachment 4.

VII. Technical Assessment

A. Site Clean Up Goals

The declaration statement for the 1988 ROD states that the selected remedy should protect public health and the environment by preventing ingestion of contaminants found in the ground water, and by restoring the contaminated aquifer.

The ROD states the target cleanup levels are health driven and that PCE is the major contaminant of concern. The ROD established cleanup criteria of 5 ug/l PCE for ground water and surface water cleanup and 1,200 ug/kg PCE for soil cleanup. PCE is the only compound having specific clean up goals stated in the original ROD. The discussion that is presented in the original ROD suggests that other degradation contaminants that are related to PCE, namely trichloroethylene (TCE), *cis* and *trans* forms of 1,2-dichloroethylene (total 1,2-DCE), and vinyl chloride, would also likely be remediated to acceptable levels as the PCE cleanup proceeds. This rationale was used because PCE was the primary contaminant that was released and the concentration of PCE at the source area was many times greater than concentrations of other secondary contaminants. As PCE is remediated, the source from which these secondary contaminants form becomes diminished, reducing their potential occurrence. Further, the remediation technologies used at the Site for PCE are also effective in removing the secondary contaminants.

The cleanup level of 5 ug/l for PCE in ground water was derived from various applicable or relevant and appropriate requirements (ARARs), including the Maximum Contaminant Level (MCL) and the National Pollutant Discharge Elimination System (NPDES) permit requirements for aquatic life for PCE (ROD, June 1988). All potential contaminants in the discharge must also meet NPDES requirements. The cleanup level is applicable to both restoring the aquifer and to the discharge the treatment system effluent to the municipal water treatment system and the Long Prairie River.

According to the ROD, the primary cleanup goal for remediation of the site is to "*provide a safe drinking water supply for present and future users of the Long Prairie Sand Plain aquifer*". The specific remedial action objectives (RAOs) designed to meet this goal are:

1. Restoring the contaminated portion of the ground water aquifer beneath the City of Long Prairie to a safe drinking water standard 5 ug/l or less PCE. In accordance with the ROD, if the 5 ug/l PCE target level is not achievable as indicated by such asymptotic removal rates from the aquifer or scientifically defensible data analysis from regular ground water monitoring, alternate concentration levels may be considered. Alternate concentration levels will require a justification document before any system is shut off.

2. Preventing spread of contaminated ground water to wells presently unaffected, including the City of Long Prairie municipal supply wells #3 and #6 (Barr, April 2002, Figure 2). This may require operation of the ground water remediation system to provide the required

preventive action, despite any determination that restoration of the ground water aquifer to 5 ug/l PCE is not possible (Barr, April 2002), (ESD, 1994).

3. Remediating soil at the former dry cleaning facility, the source area of the PCE release. The ROD establishes a cleanup standard of 1,200 ug/kg for PCE soil contamination. The RAO identified in the ROD was to remove the source of PCE contamination leaching to the ground water by remediating soils at the source of the release.

4. Providing an alternate water supply for persons using the contaminated portions of the aquifer (ESD, 1994).

Revised RAOs identified since the original ROD was developed include:

1. Preventing discharge of contaminated ground water and treatment system effluent to the Long Prairie River and bordering wetlands. At the time the ROD was written, it was not established that the plume had migrated far enough to impact the Long Prairie River and adjoining wetlands. The original ROD had already established a surface water cleanup standard of 5.0 ug/l. Updated discharge standards set by the MPCA Water Quality Section on April 17, 1997 are 8.9 ug/l for PCE, 120 ug/l for TCE, and 9.8 ug/l for vinyl chloride (Table 4, MPCA Memorandum, April 1997). No standard was established for total 1,2-DCE. These concentrations are based on chronic aquatic life protection standards with no allowance for dilution, and they are applicable to discharges of treatment system effluent and contaminated ground water.

2. Secondary goals of the soil source area remediation recognized since the ROD are reducing potential dermal and inhalation exposure to chlorinated solvent contamination during future excavation work near the former dry cleaning facility and reducing possible inhalation of vapors in nearby buildings.

B. Evaluation of Remedial Actions

This section includes responses to questions A, B, and C for of each of the major goals of the OU s comprising the remedial action at the site. A discussion about how each OU is functioning, and recommendations for improvement are provided.

1. Aquifer Remediation Ground Water Pump and Treat System (OU1)

The ground water pump and treat system began operating during May 1996. The system consists of nine recovery wells and a granular activated carbon treatment system (Barr, April 2002, Figures 5 and 7). The recovery wells are spread out over 3,000 feet along the axis of the plume, and the system is designed to continuously recovery and treat up to 250 gallons of water per minute year-round. The system is designed to remediate the aquifer by removing and treating chlorinated solvent-contaminated water and to control the flow of ground water to prevent the spread of contamination into unaffected areas, especially, toward nearby municipal wells #3 and #6. During the current year and past two years, four of the nine recovery wells

have been left on standby to allow for higher pumping rates for wells closer to the center of the plume. The average weekly pumping rates of 220 to 270 gallons per minute have been maintained over the past two years.

Question A: Is the remedy functioning as intended by the decision documents?

This portion of the remedy is functioning as intended by the decision documents. The ground water pump and treat system continues to remove a significant amount of chlorinated solvent contamination from the aquifer.

The system was designed to operate for up to 20 years; however, at this point in time, it is not clear how long it will take to achieve the ultimate goal of restoring the aquifer to less than 5 ug/l PCE. The plume mass and observed concentration of contaminants have steadily declined since the system began operating, and the system still is removing a significant amount of volatile organic compounds (VOCs) from the aquifer (Barr, 2002). As of April 2001, an estimated 429 pounds of VOCs had been removed from the aquifer by the pump and treat system, and the average concentration of VOCs measured in monitoring well samples and the system influent has continued to decrease (Barr, 2002). From October 1999 through April 2001, rate of removal was over 65 pounds per year, compared to approximately 89 pounds per year measured during the first year of operation.

Based upon these observations, it appears that the system is effective and that continued operation will be beneficial for at least the next few years. The MPCA staff plans to commission an investigation to re-evaluate the projected long-term effectiveness of the system and natural attenuation potential during 2003. The results of this investigation will be used to estimate the number of additional years of system operation needed.

The system has been functioning reliably since it was started. The presence of reduced iron in the aquifer has required routine maintenance to keep the system functioning properly. Routine maintenance activities that are required include changing and cleaning pumps as needed, pigging lines one or two times per year, and cleaning GAC filters several times per year. The MPCA's operations contractor, Barr Engineering Company, monitors the system on a weekly basis, and routine system performance and compliance samples are collected monthly.

The monitoring and treatment system equipment is protected from unwanted access. Locked protective casings cover all of the monitoring and recovery wells, and the lines to the treatment plant are buried below grade. The treatment system is enclosed in secure building that is kept locked.

Question B: Are the exposure assumptions, toxicity data, clean-up levels, and RAOs used at the time of the remedy still valid?

The ultimate goal of restoring the aquifer to a condition that is suitable to use for drinking water is still valid; however, the ROD only identifies an aquifer cleanup standard and drinking

water standard for PCE. No standards were proposed for other related secondary contaminants (TCE and total 1,2-DCE) also present in the aquifer. Exposure assumptions are now being considered for these compounds as well as PCE.

The original ROD did not include standards for other compounds because PCE was the chemical that was released at the former dry cleaning facility. When the ROD was written in 1988, the concentration of PCE contamination in the aquifer was very high relative to other chlorinated solvent compounds. Since the ROD, much of the PCE release has been removed and natural degradation has been occurring. Now it is recognized that the concentrations of other chlorinated solvent compounds that are related to natural degradation of PCE (TCE and total 1,2-DCE) are also present at significant concentrations in the aquifer. Routine monitoring samples are also tested for vinyl chloride, as it is also a degradation product of PCE, but this potential contaminant has not been detected in the aquifer. These and other chlorinated solvent compounds are routinely monitored for comparison to their respective current MDH HRLs when making any decisions regarding water quality and plume migration.

The current MDH HRLs for TCE and total 1,2-DCE are 5 ug/l and 70 ug/l, respectively. The federal and State standard for the *trans* isomer of 1,2-DCE is 100 ug/l and for the *cis* isomer is 70 ug/l. Because 1,2-DCE exists predominantly as the *cis* isomer, and drinking water standards are lower for this isomer, MPCA generally refers to the combined concentration of the two isomers as total 1,2-DCE. The total concentration is compared to the more conservative 70 ug/l standard when evaluating water quality results (Tables 4 and 5).

The MPCA staff have recently been informed that 1,4-dioxane is another compound that can be associated with chlorinated solvents at Superfund sites. The dioxane is used as a stabilizer for these solvents PCE contamination at some sites. No samples at this site have been tested for this compound. The MPCA staff plans to have selected samples analyzed for this compound during upcoming sampling events.

Site conditions and land use have not changed significantly in the vicinity of the plume since this portion of the remedy was implemented (Barr, April 2002, Figure 1). During the Site inspection interview, we learned that a new irrigation well may have recently been installed at the high school athletic complex located about ¼ mile northeast of the plume. Construction and operating details for this well are being sought so that its potential affects on the aquifer and plume can be evaluated for the 2002 annual report.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The MPCA staff is not aware of other new information that would call into question the protectiveness of this portion of the remedy at this time.

2. Containment of Ground Water Plume (OU 1)

Question A: Is the remedy functioning as intended by the decision documents?

The second major goal of the ground water pump and treat system is to prevent the spread of contaminated ground water to unaffected areas of the aquifer, especially to the east toward municipal wells #3 and #6 (Barr, April 2002, Figures 7 and 8). Both of these wells are less than 1500 feet east of the plume. According to the latest Annual Monitoring Report, it appears that this portion of the remedy is functioning as intended by the decision documents (ROD and ESDs). However, the MPCA has some concerns about the adequacy of the current ground water monitoring system. Installation of at least one additional sidegradient sentry well is recommended to assure that this portion of the remedy is functioning properly.

The 2001 Annual Report prepared by Barr Engineering concludes that the plume appears to be diminishing in concentration and that ground water monitoring results indicate no lateral migration of the plume eastward toward the municipal wells. The ground water monitoring results also indicate that groundwater has consistently been flowing toward the northwest, which is sidegradient to the municipal wells. The Barr report concluded that the most recent capture zone analysis, incorporating the 2001 recovery well pumping rates into its MODFLOW computer model (1999), indicates that the recovery system is controlling the plume migration.

Despite the positive capture zone modeling results and the reduction in contamination concentrations seen in the plume, new information hints that the monitoring system may not be adequate to verify whether the plume is being contained from entering the lower sand aquifer capture zone for municipal well #3 (Tables 5 and 6). Trace concentrations of *cis*-1,2-DCE have been detected in this municipal supply well during recent monitoring events conducted since 2000. The recent detection may be due to the use of lower detection limits, which are available since changing laboratory methods from GC to GC/MS methods during the 2000 monitoring season. This was done to achieve better detection limits over the identification of contaminants.

Currently there is only one nest of monitoring wells located east of the plume, and there are no monitoring wells located between the plume and municipal well #3 (Barr, April 2002, Figures 4 and 7). The MPCA staff recommends installing at least one additional monitoring well east of the plume to monitor possible lateral migration in the confined portion of the lower sand aquifer. The additional well(s) would provide better information on flow directions and possible contaminant migration in confined portion of the lower aquifer east of the plume, and would provide verification of the current capture zone model for the lower aquifer.

Question B: Are the exposure assumptions, toxicity data, clean-up levels, and RAOs used at the time of the remedy still valid?

Issues related to ground water exposure assumptions and RAOs for this portion of the remedy are discussed in the previous ground water pump and treatment system section.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The MPCA staff is not aware of other new information that would call into question the protectiveness of this portion of the remedy at this time.

3. Contaminated Soil Source Area Cleanup (OU 2)

A soil vapor extraction (SVE) system was installed to remove the soil contamination in the source area near the former dry cleaning facility that was traced to the release. The contaminated soil source area that was remediated is paved parking and alley-way area of approximately 15,000 square feet which is bordered on all sides by commercial buildings (Barr, August 2000, Figure 2). Reportedly, PCE was dumped down a dry well located in this area.

The SVE system operated from September 1997 through March 2000. The MPCA approved permanent shutdown and dismantling of the system on March 16, 2000, after soil cleanup goals were met for the source area (Barr, August 2000). Remediating this area has greatly reduced the source of PCE that was leaching into and contaminating ground water, thus allowing the plume to attenuate more rapidly. Important secondary benefits of the source cleanup are greatly reducing the potential direct exposure to contaminated soil during future construction work or land use changes, and reducing the potential for exposure to chlorinated solvent vapors in nearby buildings.

The objectives for the soil source area cleanup have been successfully accomplished. The cost for construction and implementation of this remedy objective was over 70% less than estimated by the ROD, and the response action was completed well within the projected timeframe.

Question A: Is the remedy functioning as intended by the decision documents?

This portion of the remedy is functioning as intended by the cleanup documents. Soil remediation at the source area was successfully completed in March 2000.

Question B: Are the exposure assumptions, toxicity data, clean-up levels, and RAOs used at the time of the remedy still valid?

The exposure assumptions and RAOs used at the time of the remedy selection for cleanup of soil at the source is still valid. The soil cleanup standard of 1,200 ug/kg PCE was stipulated in the ROD and was achieved by the soil cleanup remedy. The current unrestricted direct soil exposure standard for PCE in Minnesota is 70,000 ug/kg. Other potential contaminants of concern (TCE, *cis*-1,2-DCE, and vinyl chloride) were detected at very low concentrations in the system emissions samples, and they were not detected in soil confirmation samples collected after the system was shutdown (Barr, August 2000). Conditions and general land use at the site have not changed significantly since this portion of the remedy was implemented.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The MPCA staff is not aware of other new information that would call into question the protectiveness of this portion of the remedy at this time.

4. Alternative Water Supply (OU 3)

A Minnesota Department of Health (MDH) Drinking Water Advisory for the area underlain and threatened by the plume of contaminated ground water was first established in 1983 and was expanded in 1994 (Barr, April 2002, Figure 2). Two City water supply wells and over 40 individual residential and commercial water supply wells in the advisory area were contaminated with PCE, and it was determined that over 300 private water supply wells in the area were threatened by the chlorinated solvent release. A new municipal water supply well and water mains were installed by the city of Long Prairie in 1984 with non-EPA federal grant assistance, and construction of new water lines to supply municipal water to nearly all properties within the extended advisory zone was completed with EPA assistance in 1997.

The MPCA has requested a well installation advisory area designation from MDH, which requires that MDH be notified prior to installing water supply wells in the advisory area. This will ensure that MDH can advise the installer about existing conditions and well construction. Nearly all property owners in the area were given the opportunity to have their existing water supply wells abandoned by the MPCA. Some property owners may have elected to keep their existing supply wells for secondary use. One property is using bottled water and one property is periodically monitored due to construction constraints which prevented installations of the water line.

Question A: Is the remedy functioning as intended by the decision documents?

This portion of the remedy is functioning as intended by the decision documents. Completing these actions has achieved the goal of providing a safe alternative water supply to ground water users in the contaminated area. Continued oversight is necessary to assure that current water supply wells remain uncontaminated and that existing or new water supply wells are not used in the contaminated area until the aquifer has been restored to an acceptable condition for drinking water use.

Question B: Are the exposure assumptions, toxicity data, clean-up levels, and RAOs used at the time of the remedy still valid?

Relative to providing a safe alternative water supply, one exposure assumption used at the time of the remedy selection has been updated since the original remedy selection. The ROD only identified an aquifer cleanup standard and drinking water standard for PCE. No standards were proposed in the ROD to address related contaminants (TCE and total 1,2-DCE) also present in the aquifer. These compounds (in addition to PCE) are now considered in the exposure assumptions for all of the RAO.

The original ROD did not include standards for these other secondary organic compounds because PCE was the chemical that was released at the former dry cleaning facility. When the ROD was written in 1988, the concentration of PCE in the aquifer was several orders of magnitude greater than the other chlorinated compounds. Since the issuance of ROD, much of the PCE release has been actively removed via the RA and passively removed through the processes of natural degradation. It is now recognized that the concentrations of other chlorinated solvent compounds that are associated with the natural degradation of PCE (TCE and

total 1,2-DCE) are also present at significant concentrations in the aquifer. Routine monitoring samples are also tested for vinyl chloride, but this potential contaminant has not been detected in the aquifer to date. These and other chlorinated solvent compounds are routinely monitored for and the concentrations of these contaminants will be compared to their current MDH Health Risk Limits (HRLs) when making any decisions regarding water quality and plume migration.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Ongoing oversight continues to be needed to assure that existing or new water supply wells are not used in the contaminated area, and that this portion of the remedy remains protective. Actions that are currently being planned by the MPCA to assure that safe alternative water supplies are being used are listed below (Tables 5 and 6).

1. One active residential supply well located near the edge of the existing plume may be at risk. City water service was not connected to this house during the water line construction because the house was relatively isolated and chlorinated solvents had not been detected in it. The current MPCA staff plans to continue monitoring this well on a regular basis because of its close proximity to the plume. If contamination is detected, this residence would be supplied with bottled drinking water.

2. During the site inspection, a small sand-point well was observed in the yard of a residential property located in the advisory area near the middle of the plume. The well appeared to have been set up for seasonal use. The MPCA will contact this property owner to advise them to abandon the well.

3. The MPCA staff also plan to conduct an updated water use survey during 2003 to identify any other new or previously unidentified water supply wells which may be used in the area and to assure that this remedy remains current. Also, the MPCA plans to periodically send out updates to property owners in the advisory area about the ground water contamination clean-up process

5. Surface Water Protection

During the mid 1990s (after the original ROD was completed), it was recognized that the chlorinated solvent plume had expanded. It migrated beneath the wetlands, which border the Long Prairie River and was potentially discharging to these surface waters bodies. MPCA Water Quality Division staff was consulted for federal and state compliance requirements. As a result, additional investigation was conducted in 1997 to better define the downgradient edge of the plume. The pump and treat system was redesigned to include two additional recovery wells (RW8 and RW9) located near the edge of the wetlands and the downgradient edge of the plume (Barr, April 2002, Figure 7).

These additional recovery wells are designed to remove contaminant mass from the downgradient portion of the plume and to control the flow direction of the chlorinated solvent plume from discharging upward toward the ground surface at the wetland and River. The

objective of the additional recovery wells is to prevent the discharge of ground water, containing contaminants at levels exceeding surface water quality standards, to the Long Prairie River and bordering wetland. Also, eight additional ground water monitoring wells were installed to better monitor ground water quality and flow in this area.

Question A: Is the remedy functioning as intended by the decision documents?

This portion of the remedy is functioning as planned. Ongoing monitoring of test wells installed near the Long Prairie River and bordering wetlands will be needed to assure that this portion of the remedy continues to function properly. Levels of chlorinated solvent contamination in the ground water beneath the wetland area have decreased significantly since the system began operating. Monitoring results for 2001 indicated that the plume discharge standards beneath the wetland are being met (Barr, 2002).

Question B: Are the exposure assumptions, toxicity data, clean-up levels, and RAOs used at the time of the remedy still valid?

The objective of the additional recovery wells is to prevent discharge of ground water having contaminant concentrations above the surface water quality standards to the Long Prairie River and the bordering wetland. The ROD establishes a surface discharge standard of 5.0 ug/l for PCE. This standard was based on the PCE MCL, which was below the aquatic standard at time of the ROD. The ROD does not establish surface water discharge standards for other potential contaminants of concern.

Specific surface water standards established in 1997 by the MPCA Water Quality Division for the river and wetland at this Site are 8.9 ug/l for PCE, 120 ug/l for TCE and 9.8 ug/l for vinyl chloride (Table 4, MPCA Water Quality Division Memorandum, 1997). The standards are based on chronic wildlife exposure limits with no consideration for dilution.

Monitoring results for 2001 indicated that the plume discharge standards beneath the wetland are being met (Barr, 2002). Six of the ten existing monitoring wells, located along the border of the wetland and river, have been sampled during the past two years. Most of these are deeper nested wells that are completed about 20 to 30 feet deep across the vertical section of the aquifer with the highest levels of contamination. Several of the shallow nested wells near the edge of the wetland area were not sampled during the last two years because contaminants had not been detected in them during previous sampling rounds. All of the monitoring wells along the wetland boundary will be sampled during the next year to assure that surface water discharge standards are still being met in the shallow wells.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The MPCA staff is not aware of other new information that would call into question the protectiveness of this portion of the remedy at this time.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the ESDs. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Most ARARs for ground water and soil contamination cited in the ROD have been met. Any changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment or changes to the standardized risk assessment methodology have been factored into the consideration of the protectiveness of the remedy. There are no changes in action-specific or location-specific requirements.

Table 4: Changes in Chemical-Specific Standards

PCE	ground water	5.0 ug/l drinking water standard	**Original ROD 1988**	5.0 ug/l	ROD/1988 - Based on proposed Federal SDWA MCL
			New	5.0 ug/l	Federal SDWA Final MCL/ Phase II VOCs 1991
				7.0 ug/l	MDH HRL, MN Rules 4717.7100-4717.7800/ December 1, 1994
PCE	surface water	5.0 ug/l standard for effluent and plume discharge	**Original ROD 1988**	5.0 ug/l for treatment system effluent	ROD/1988 - Based on proposed Federal SDWA MCL
			New	5.0 ug/l	Federal SDWA MCL/ Phase II VOCs 1991
				8.9 ug/l	Minnesota Site-Specific Class 2B Surface Water Standard, MN Rules 7050/ established for site by MPCA Division of Water Quality, April 17, 1997
PCE	soil	1.2 mg/kg exposure standard	**Original ROD 1988**	1.2 mg/kg	Presented in original ROD - based on U.S. EPA target cleanup levels for a 10 kg child ingesting 5 grams of soil for 5 years
			New		
				72 mg/kg	MPCA unrestricted dermal exposure standard/ 1998 MPCA RBSE Guidance

Table 4: Changes in Chemical-Specific Standards (Continued)

TCE	ground water	5.0 ug/l drinking water standard	**Original ROD 1988**	none	No specific standard presented in 1988 ROD
			New	5.0 ug/l	Federal SDWA Final MCL/ Phase II VOCs 1991
				30 ug/l	MDH HRL, MN Rules 4717.7100-4717.7800/ December 1, 1994
				5.0 ug/l	Proposed MDH HRL/ 2002
TCE	surface water	5.0 ug/l standard for effluent and plume discharge	**Original ROD 1988**	none	No specific standard presented for TCE in 1988 ROD
			New	5.0 ug/l	Federal SDWA Final MCL/ Phase I VOCs 1987
				120 ug/l	Minnesota Site-Specific Class 2B Surface Water Standard, MN Rules 7050/ established for site by MPCA Division of Water Quality, April 17, 1997
TCE	soil	no exposure standard	**Original ROD 1988**	none	No specific standard presented for TCE in 1988 ROD
			New	29 mg/kg	MPCA unrestricted dermal exposure standard/ 1998 MPCA RBSE Guidance

Table 4: Changes in Chemical-Specific Standards (Continued)

1,2-DCE (cis)	ground water	70 ug/l drinking water standard	**Original ROD 1988**	none	No specific standard for DCE presented in 1988 ROD
1,2-DCE (cis)	ground water	70 ug/l drinking water standard	New	70 ug/l	Federal SDWA Final MCL/ Phase II VOCs 1991
				70 ug/l	MDH HRL, MN Rules 4717.7100-4717.7800/ December 1, 1994
1,2-DCE (cis)	surface water	70 ug/l standard for effluent and plume discharge	**Original ROD 1988**	none	ROD/ 1988
			New	70 ug/l	Federal SDWA Final MCL/ Phase II VOCs 1991
				none	Minnesota Site-Specific Class 2B Surface Water Standard, MN Rules 7050/ established for site by MPCA Division of Water Quality, April 17, 1997
1,2-DCE (cis) or total 1,2-DCE (as mixed isomers)	soil	no soil exposure standard established for site	**Original ROD 1988**	none	No specific soil exposure standard presented in 1988 ROD
			New	8 mg/kg	MPCA unrestricted dermal exposure standard/ 1998 MPCA RBSE Guidance
1,2-DCE (trans)	ground water	100 ug/l drinking water standard	**Original ROD 1988**	none	No specific standard for DCE presented in 1988 ROD

Table 4: Changes in Chemical-Specific Standards (Continued)

1,2-DCE (trans)	ground water	100 ug/l drinking water standard	**New**	100 ug/l 100 ug/l	Federal SDWA Final MCL/ Phase II VOCs 1991 MDH HRL, MN Rules 4717.7100-4717.7800/ December 1, 1994
1,2-DCE (trans)	surface water	no surface water standard established for site	**Original ROD 1988** **New**	none 100 ug/l none	ROD/1988 Federal SDWA Final MCL/ Phase II VOCs 1991 Minnesota Site-Specific Class 2B Surface Water Standard, MN Rules 7050/ established for site by MPCA Division of Water Quality, April 17, 1997
1,2-DCE (trans)	soil	no soil exposure standard established for site	**Original ROD/ 1988** **New**	none 11 mg/kg	No specific soil exposure standard presented in 1988 ROD MPCA unrestricted dermal exposure standard/ 1998 MPCA RBSE Guidance

Table 4: Changes in Chemical-Specific Standards (Continued)

Vinyl Chloride	ground water	0.2 ug/l drinking water standard	**Original ROD 1988**	none	No specific ground water cleanup standard presented for vinyl chloride in 1988 ROD
			New	2.0 ug/l 0.2 ug/l	Federal SDWA Final MCL/ Phase I VOCs 1987 MDH HRL, MN Rules 4717.7100-4717.7800/ December 1, 1994
Vinyl Chloride	surface water	2.0 ug/l standard for effluent and plume discharge	**Original ROD 1988**	none	No specific surface water cleanup standard presented for vinyl chloride in 1988 ROD
			New	2.0 ug/l 9.8 ug/l	Federal SDWA Final MCL/ Phase I VOCs 1987 Minnesota Site-Specific Class 2B Surface Water Standard, MN Rules 7050/ established for site by MPCA Division of Water Quality, April 17, 1997
Vinyl Chloride	soil	0.25 mg/kg exposure standard	**Original ROD 1988**	none	No specific soil cleanup standard presented for vinyl chloride in 1988 ROD
			New	0.25 mg/kg	MPCA unrestricted dermal exposure standard/ 1998 MPCA RBSE Guidance

VIII. Issues

Table 5: Issues

1. possible use of existing undocumented water supply wells in the contaminated area, especially by new property owners that might be unaware of ground water contamination problems	Yes	Yes
2. threatened contamination of one existing residential water supply well located near the east edge of the plume	No	Yes
3. adequate ground water monitoring of lower aquifer between plume and municipal water supply wells	No	Yes
4. possible low-level total 1,2-DCE contamination in municipal supply well #3	No	Yes
5. ongoing maintenance and performance monitoring needed to assure ground water pump and treat system continues to operate properly	No	Yes
6. construction of new irrigation wells on school property approximately ¼ mile northeast of current plume boundary	No	Yes
7. possible presence of 1,4-dioxane which has been found to occur with chlorinated solvent contamination at other sites	No	Yes
8. assure that adequate monitoring is being conducted to assess potential plume discharge to the Long Prairie River and adjoining wetlands	No	Yes

IX. Recommendations and Follow-up Actions

Table 6: Recommendations and Follow-Up Actions

1. possible use of existing undocumented water supply wells in the contaminated area, especially by new property owners that might be unaware of ground water contamination problems this is a significant issue for this site because the contaminated ground water is in a very shallow sand aquifer, and it is very easy for citizens to install inexpensive sand point wells that provide good water yields	a. request updated list of municipal water supply users for the health advisory area from the City of Long Prairie b. conduct an updated ground water receptor survey to identify an possible new or formerly unidentified supply wells that are being used in the advisory area c. use information from the above survey to identify and inform ground water users in the advisory area	NA	MPCA	2003	Yes	Yes
2. threatened contamination of one existing residential water supply well located near the east edge of the plume	a. this residential supply well will be added to the routine monitoring program b. bottled water or carbon filtration will be offered if contamination is present	NA	MPCA	2002	No	Yes

3. adequate ground water monitoring of lower aquifer between plume and municipal water supply wells	a. the MPCA staff has recommended installing a ground water monitoring well in the lower sand aquifer between the plume and municipal well #3	NA	MPCA	2003	No	Yes
4. possible low-level DCE contamination in municipal supply well #3	a. drinking water standards have not been exceeded, routine monitoring for DCE and other VOCs will continue	NA	MPCA	ongoing	No	Yes
5. ongoing maintenance and performance monitoring needed to assure ground water pump and treat system continues to operate properly	a. the level of maintenance and performance monitoring that is being conducted is adequate, b. maintenance and monitoring will need to continue in the future	NA	MPCA	ongoing	No	Yes
6. construction of new irrigation wells on school property approximately ¼ mile northeast of current plume boundary	a. acquire information about well construction, capacity, and operating frequency b. incorporate information into Barr's site ground water model and capture zone analysis	NA	MPCA	2003	No	Yes

7. possible presence of 1,4-dioxane which has been found to occur with chlorinated solvent contamination at other sites	a. collect two rounds of representative samples from ground water monitoring wells and system influent and effluent to verify whether or not this compound is present	NA	MPCA	2003	No	Yes
8. assure that adequate monitoring is being conducted to assess potential plume discharge to the Long Prairie River and adjoining wetlands the number of monitoring wells sampled along the river and wetlands had been reduced during the past couple of years	a. modify the ground water monitoring plan to include regular sampling of all nested monitoring wells that are located along the edge of the Long Prairie River and adjoining wetlands	NA	MPCA	2002	No	Yes

X. Protectiveness Statements

The Ground Water portion of the remedy (OU 1) that involves remediation of contaminated ground water to safe drinking water standards will offer long-term permanent protection for future users of the aquifer once it is complete. This remedial action involves pumping and treating ground water from the contaminated portion of the aquifer. The pump and treatment system began operating in 1996, and since that time, levels of chlorinated solvent contamination in the ground water has continued to decrease significantly each year. This portion of the remedy is not yet complete. It is not known how much longer the system will need to operate before the final objective is met.

The Soil Remediation portion of the remedy (OU 2 - remediation of contaminated soil at the source area) has been completed. This portion of the remedy offers long-term permanent protection from leaching of contamination to the aquifer and from human exposure to PCE soil contamination and vapors near the source area. This portion of the remedy is protective of human health and the environment.

B. Protective in the short-term:

The Ground Water portion of the remedy (OU1) that involves containment of contaminated ground water from migrating to previously uncontaminated areas of the aquifer, especially toward municipal wells #3 and #6 currently is functioning as planned and is offering short-term protection to human health and the environment. Both of these wells are less than 1500 feet east of the plume. The 2001 Annual Report (Barr, 2002) concludes that the plume appears to be diminishing in concentration and the ground water has consistently been flowing toward the northwest, which is sidegradient to the municipal wells. The annual report also concludes that the most recent capture zone analysis shows that the recovery system is controlling the plume migration.

Despite these positive observations, MPCA staff feels that the monitoring system is not adequate to verify whether the plume is being contained from entering the lower sand aquifer capture zone for municipal wells #3. The MPCA staff recommends installing at least one additional monitoring well east of the plume to monitor possible lateral migration in the confined portion of the lower sand aquifer.

The Ground Water portion of the remedy (OU3) that involves providing an alternative water supply to users of the contaminated portion of the aquifer currently protects human health and the environment. A drinking water advisory for the area underlain by the plume of contaminated ground water is in place. Two new municipal water supply wells was installed for the city of Long Prairie in 1984, and construction of new water lines to supply municipal water to nearly all properties within the advisory zone was completed in 1997.

Ongoing oversight continues to be needed to assure that existing or new water supply wells are not used in the contaminated area, and that this portion of the remedy remains protective. In order for the remedy to be protective in the long-term, the following actions need to be taken

3. The current MPCA staff identified one active residential supply well located near the edge of the existing plume that may be at risk. City water service was not connected to this house during the water line construction because the house was relatively isolated and chlorinated solvents had not been detected in it. The current MPCA staff plans to continue monitoring this well on a regular basis because of its close proximity to the plume. If contamination is detected, this residence could be supplied with bottled drinking water.

4. During the site inspection, a small sand-point well was observed in the yard on a residential property that is located in the advisory area and near the middle of the plume. It appeared that this well was set up for seasonal use. The MPCA will contact this property owner advise them to have this well abandoned.

5. The MPCA staff also plans to conduct an updated water use survey during 2002 and 2003 to try to find any other new or previously unidentified supply wells that might be being used in the area and to assure that this remedy remains up to date. Also, the MPCA plans to periodically send out updates about the ground water contamination clean up process to property owners in the advisory area.

The Ground Water portion of the remedy that involves preventing discharge of contaminated ground water to the surface waters of the Long Prairie River and adjoining wetlands currently is functioning as planned and offers short-term protection to surface water. Recovery wells RW8 and RW9 are designed to remove contaminant mass from the downgradient portion of the plume and to control the flow direction of the chlorinated solvent plume from discharging upward toward the ground surface at the wetland and river. Levels of chlorinated solvent contamination in the ground water beneath the wetland area have decreased significantly since the system began operating. Monitoring results for 2001 indicated that the plume discharge standards beneath the wetland are being met (Barr, 2002).

Several of the shallow nested wells near the edge of the wetland area were not sampled during the last two years because of contaminants had not been detected in them during previous sampling rounds. The MPCA plans to have all of the monitoring wells along the wetland boundary sampled during the next year to assure that surface water discharge standards still are being met in the shallow wells.

The remedy is protective of human health and the environment in the short term. There are no current exposure pathways and the remedy appears to be functioning as designed. The removal of VOCs from the soil has eliminated the source of contamination. The continued removal of extraction and treatment of ground water for VOCs has minimized migration of contaminants to ground water and surface water and is restoring the aquifer to cleanup goals. Direct ingestion of, and contact with, contaminants in soils, ground water and surface water has

been prevented or minimized. Long-term protectiveness will be achieved upon attainment of the cleanup goals.

XI. Next Review

The primary RAO of restoring the ground water beneath the City of Long Prairie to safe drinking water conditions has not yet been achieved; therefore continued ground water remediation, containment, and monitoring is still needed. In accordance with current EPA policy for federal superfund sites, the next five-year review would be conducted by the end of September 2007.

The process of delisting this site has not been initiated. During 2003, the MPCA plans to commission an investigation to evaluate the effectiveness of the ground water treatment system and to estimate the number of years of additional treatment system operation and natural attenuation that will be needed before the ground water restoration objectives are met. The MPCA staff expects that it will be at least five years or more before all ground water and surface water RAOs are met and verified. However, delisting is anticipated in late 2007 after EPA funding is completed with the end of the LTRA, as long as other delisting criteria are met.

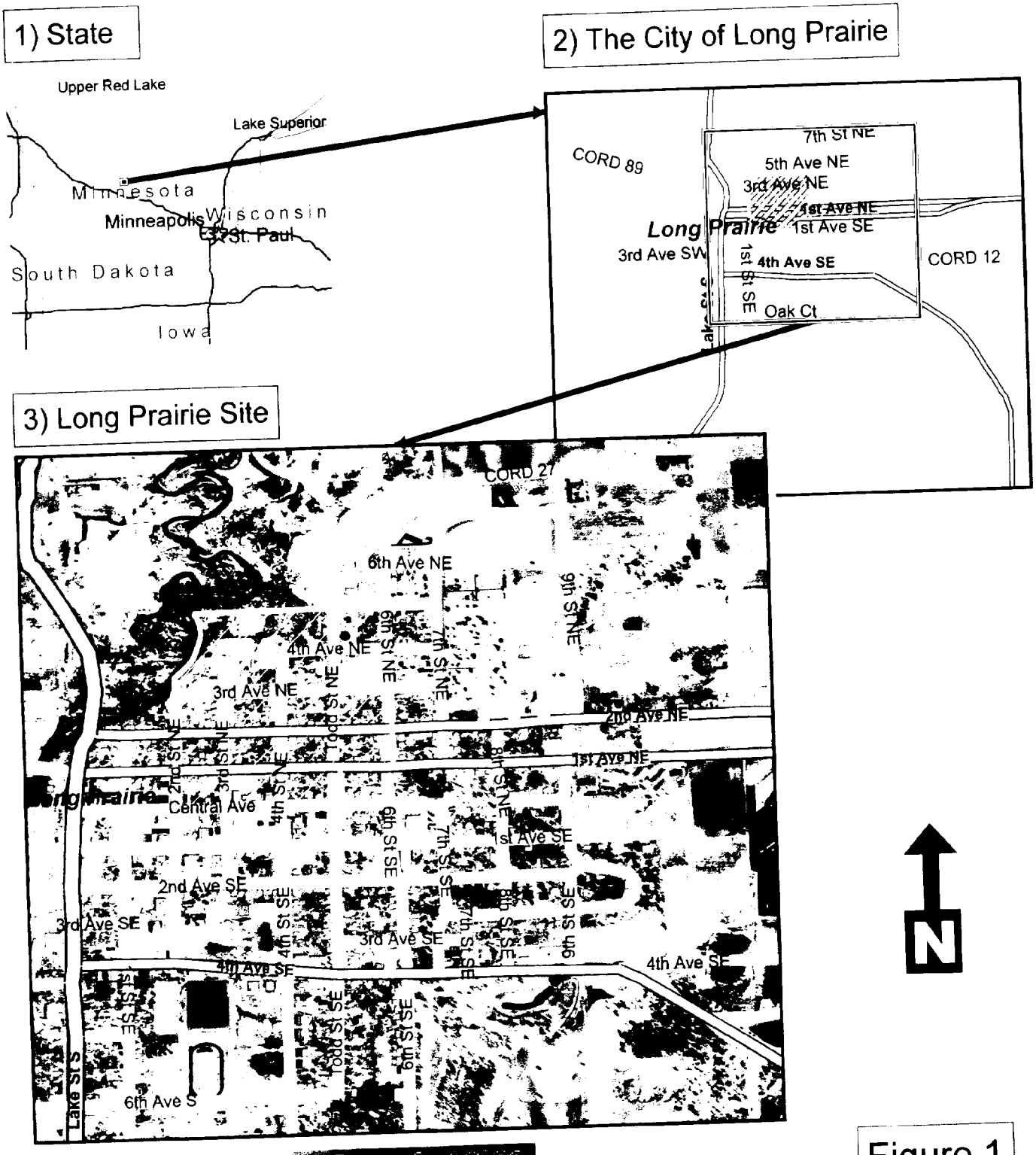
Attachments

Attachment 1 - Site Maps
Attachment 2 - List of Documents Reviewed
Attachment 3 - Community Notifications
Attachment 4 - Site Inspection Checklist, Supplement with interview, and photos

Attachment 1 - Long Prairie Ground Water Contamination Superfund Site Maps
Comprehensive Site Map, showing:

- Site Location (Figure 1)
- Surface Terrain Model (Figure 2)
- Locations of city wells, recovery wells, monitoring wells, old and new advisory area boundaries, wetland of concern, and current plume as of last annual report (Figure 3)

Long Prairie Groundwater Superfund Site



Region 5 Superfund GEOS

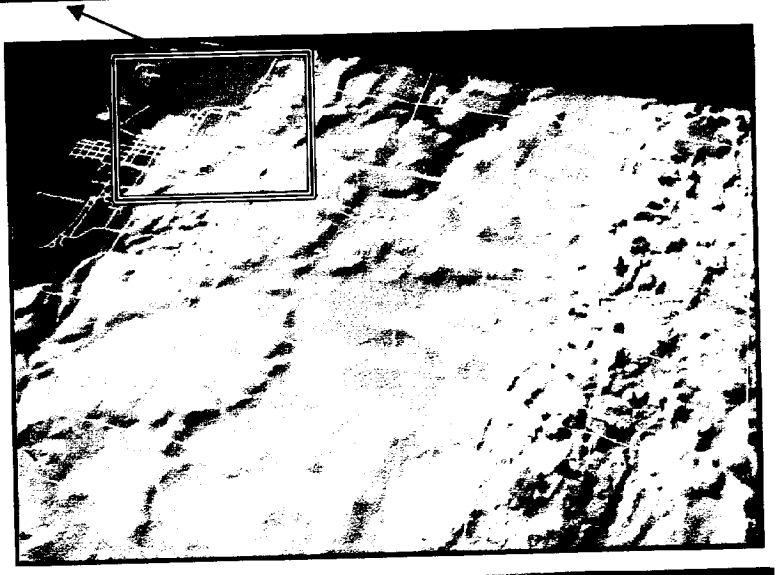
Plot created by David Wilson U.S. EPA Region 9/26/2002
B&W Image Date: 4/28/1991

Figure 1

Long Prairie Groundwater Superfund Site
3D Surface Terrain Model

Elevation Feet

- 1430 - 1460
- 1400 - 1430
- 1371 - 1400
- 1341 - 1371
- 1311 - 1341
- 1282 - 1311
- 1252 - 1282
- 1222 - 1252
- 1193 - 1222



N

Figure 2

8EPA Region 5 Superfund GEMS

Plot created by David Wilson U.S. EPA Region 5 on 9/27/2002
B&W Image Date: 4/28/1991

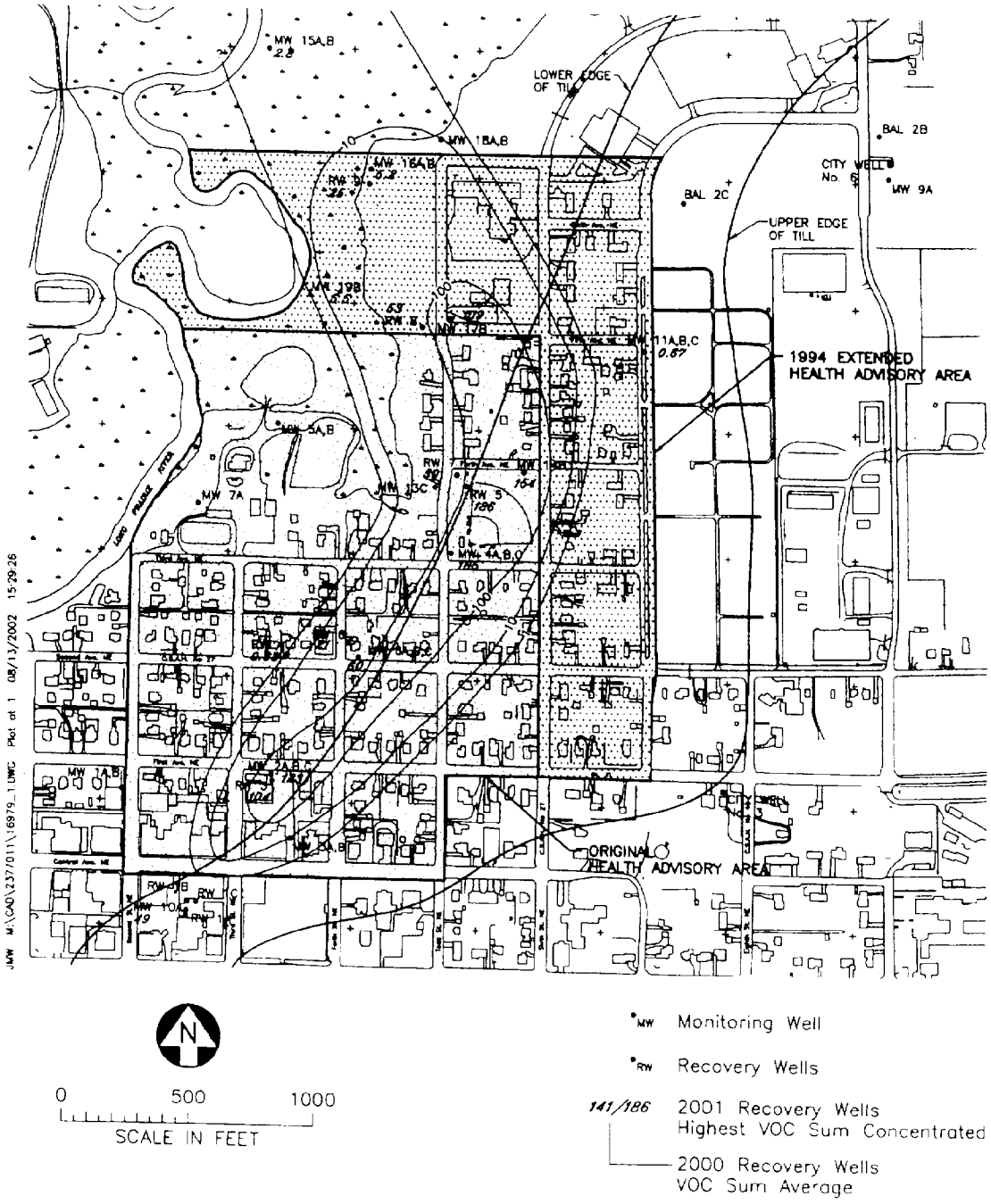


Figure _

HIGHEST SUM VOC CONCENTRATION 2000–2001
LONG PRAIRIE GROUNDWATER REMEDIATION SYSTEM
Long Prairie, Minnesota

FIGURE 3

Attachment 2 – Community Notification

- Mailing text
- News Release

Announcement of a Five-Year Review
for the
Long Prairie Ground Water Contamination Superfund Site

The Minnesota Pollution Control Agency (MPCA) is conducting a Five-Year Review of the Long Prairie Ground Water Contamination Superfund site (Site) cleanup, Long Prairie, Minnesota. The U.S. Environmental Protection Agency (EPA) supports the Site cleanup and is participating in the review. This periodic review of the ongoing remedial action is required where hazardous substances, pollutants, or contaminants remain, which is caused by dry cleaning solvent at this Site.

The purpose of the Five-Year Review is to determine continued adequacy and protectiveness of the remaining ongoing remedial action (pumpout and carbon treatment of contaminated ground water) and to evaluate whether the cleanup goals in the Site Record of Decision, as amended, remain protective of human health and the environment. The review will be completed by September 30, 2002.

The community can contribute by providing information that may have been observed at the Site or ways that the cleanup has helped the area. Local citizens are encouraged to bring information and any concerns related to the Site or requests for more information by August 19, 2002 to the attention of:

Stephen Mikkelson, Information Officer
Minnesota Pollution Control Agency
(your address)
55155
218-846-7390
Toll-free 800-657-3864

or Maureen Johnson, Project Leader
Minnesota Pollution Control Agency
520 Lafayette Road N., St. Paul, Minnesota

651-296-7353
Toll-free 800-657-3864

An EPA fact sheet is located at www.epa.gov/region5/superfund. Site documents are available for review at the Long Prairie City Offices, 42 3rd St. N., Long Prairie, Minnesota. These will provide more detail on the selected remedy.

The remedy addressed protecting public health and the environment by preventing ingestion of contaminants found in the ground water, and by restoring the contaminated aquifer. The contaminants are tetrachloroethylene and other volatile organic compounds in a ground water plume northeast from the center of the city. The Long Prairie municipal water supply was extended to private residents with drinking water wells in the plume in 1985 and 1994. A soil vapor extraction system in the back lot of the dry-cleaning facility removed the source of ground water contamination in the back lot soil by March 2000. The water from nine recovery wells controlling the plume is piped to the treatment plant at a rate of 250 gpm.

NEWS RELEASE

Minnesota Pollution Control Agency

www.pca.state.mn.us

Toll-free and TDD 1 (800) 657-3864

Saint Paul • Brainerd • Detroit Lakes • Duluth • Mankato • Marshall • Rochester • Willmar

PUBLIC INPUT SOUGHT FOR LONG PRAIRIE GROUND WATER CONTAMINATION SUPERFUND SITE REVIEW

Brainerd, Minn.— The Minnesota Pollution Control Agency (MPCA) seeks public input on a required five-year review of the Long Prairie Ground Water Contamination

FOR RELEASE: AUGUST 7, 2002

MEDIA CONTACT: STEPHEN MIKKELSON (218) 846-7
PROJECT LEADER: MAUREEN JOHNSON (651) 296-7
ALL MPCA STAFF (VOICE AND TTY) (800) 657-3

Superfund site. The U.S. Environmental Protection Agency (EPA) supports the site cleanup and is participating in the review. This periodic review of the ongoing remedial action is required where hazardous substances, pollutants, or contaminants remain, which, at this site, is caused by dry cleaning solvents.

The purpose of the five-year review is to determine continued adequacy and protectiveness of the remaining ongoing remedial action and to evaluate whether the cleanup goals in the Site Record of Decision, as amended, remain protective of human health and the environment. The remedial action at this site includes pumpout and carbon treatment of contaminated ground water. The review will be completed by September 30, 2002.

The community can contribute by providing information that may have been observed at the site or ways that the cleanup has helped the area. Local citizens are encouraged to bring information and any concerns related to the Site or requests for more information

by August 28, 2002 to the attention of:

Stephen Mikkelson, Information Officer
Minnesota Pollution Control Agency
714 Lake Ave., Ste. 220
Detroit Lakes, MN 56501
218-846-7390
Toll-free 800-657-3864

or Maureen Johnson, Project Leader
Minnesota Pollution Control Agency
520 Lafayette Road N.
St. Paul, Minnesota 55155
651-296-7353
Toll-free 800-657-3864

-more-

An EPA fact sheet is located on the internet at www.epa.gov/region5/superfund. Site documents are available for review at the Long Prairie City Offices, 42 3rd St. N., Long Prairie, Minn. These will provide more detail on the selected remedy.

The remedy addressed protecting public health and the environment by preventing ingestion of contaminants found in the ground water, and by restoring the contaminated aquifer. The contaminants are tetrachloroethylene and other volatile organic compounds in a ground water plume northeast from the center of the city. The Long Prairie municipal water supply was extended to private residents with drinking water wells in the plume in 1985 and 1994. A soil vapor extraction system in the back lot of the dry-cleaning facility removed the source of groundwater contamination in the back lot soil by March 2000. The water from nine recovery wells controlling the plume is piped to the project's treatment plant, where contaminants are removed with carbon, and the drinking water quality discharge goes to the Long Prairie River. If a local party could use the cleaned water, Maureen Johnson should be contacted at the address and/or phone number above.

-30-

Attachment 3 - List of Documents Reviewed

List of Documents Reviewed

1. Barr Engineering Company, September 1995, Assessment of Containment System Using a MLAEM Groundwater Model. Long Prairie, Minnesota.
2. Barr Engineering Company, November 1996, Remedial Action Performance Monitoring Plan, Long Prairie Groundwater Remediation System, Long Prairie, Minnesota.
3. Barr Engineering Company, August 2000, Partial Remedial Action Completion Report, Soil Contamination Operable Unit, Long Prairie Groundwater Remediation System, Long Prairie, Minnesota.
4. Barr Engineering Company, April 2002, 2000/2001 Annual Report (September 2000 through October 2001) Long Prairie Groundwater Remediation System Long Prairie, Minnesota.
5. Minnesota Department of Health, 1989 Groundwater Protection Act Health Risk Limits, December 1994: State of Minnesota Rules, Part 4717.7100 - 4717.7800, December 1, 1994.
6. Minnesota Pollution Control Agency, June 1988, Long Prairie Groundwater Contamination Site Record of Decision: United States Environmental Protection Agency, June 13, 1988.
7. Minnesota Pollution Control Agency, 1991, Long Prairie Ground Water Contamination Contamination Explanation of Significant Differences: United States Environmental Protection Agency, 1991.
8. Minnesota Pollution Control Agency, May 1994, Long Prairie Ground Water Contamination Explanation of Significant Differences: United States Environmental Protection Agency, May 31, 1994.
9. Minnesota Pollution Control Agency, April 1997, Memo form MPCA Division of Water Quality to MPCA Division of Solid Waste regarding surface water assessment at the Long Prairie ground water remediation site: MPCA, April 17, 1997.
10. Barr Engineering Co., Construction Documentation Report for the Conveyance Construction System for Recovery Wells 8 and 9, Oct. 2000
11. Minnesota Pollution Control Agency, September 19, 1997, Preliminary Close Out Report
12. Barr, Annual Reports, 1997/1998, 1998/1999, 1999/2000, 2000/2001, 2001/2002
13. Barr, First Quarter 2002 Report, Long Prairie Ground Water Remediation System
14. Barr, Second Quarter 2002 Report, Long Prairie Ground Water Remediation System
15. Malcolm Pirnie, 1996, O&M Plan and Manual
16. Minnesota Pollution Control Agency, O&M Contract with Barr, GAC subcontract
17. Minnesota Pollution Control Agency, Permits and Substantive Permit Conditions Compliance Reporting
18. Cooperative Agreement V005794-01, Sept. 24, 1984, as amended
19. Community Relations Plan
20. Federal Environmental Laws and Regulations
21. State of Minnesota Statutes and Rules
22. Minnesota Department of Health, memoranda regarding Health Based Values

Attachment 4 - Site Inspection Checklist, Supplement with Interview, and Photos

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Long Prairie	**Date of inspection:** July 31, 2002
Location and Region: Long Prairie, MN EPA R5	**EPA ID:** MND980904072
Agency, office, or company leading the five-year review: MPCA	**Weather/temperature:** After morning storms, 85-90° and partly cloudy.

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- ✓ Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- ✓ Groundwater containment
- Vertical barrier walls

Attachments: ✓ Inspection team roster attached ✓ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** J Eric Gabrielson _____ _____ 7/31/02
   Name Title Date
   Interviewed ✓ site at office by phone Phone no. _____
   ✓ Problems, suggestions; ✓ Report attached _____

2. **O&M staff** Eric _____ _____ 7/31/02
   Name Title Date
   Interviewed ✓ site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

Inspection Team:
Maureen Johnson, MPCA
Mark Elliott, MPCA
Sheila Sullivan, EPA
Eric Gabrielson, Barr
↓ERG

, Barr Chemist

Analytical Methods - changed to GC for lower Detect

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

1-2109

Agency City of Long Prairie
Contact Dale Vennecamp — Administrator — 7/30/02 — 320-732-2167
Name — Title — Date — Phone no.
Problems; suggestions; Report attached ____

Agency ____
Contact ____ ____ ____ ____ ____
Name — Title — Date — Phone no.
Problems; suggestions; Report attached ____

Agency ____
Contact ____ ____ ____ ____ ____
Name — Title — Date — Phone no.
Problems; suggestions; Report attached ____

Agency ____
Contact ____ ____ ____ ____ ____
Name — Title — Date — Phone no.
Problems; suggestions; Report attached ____

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**				
	✓O&M manual		✓Readily available	✓Up to date	N/A
	✓As-built drawings		Readily available	Up to date	N/A
	✓Maintenance logs	from consultant	✓Readily available	Up to date	N/A
	Remarks				
2.	**Site-Specific Health and Safety Plan**		Readily available	Up to date	N/A
	Contingency plan/emergency response plan		Readily available	Up to date	N/A
	Remarks RCRA Emergency Preparedness/Contingency Plan - ✓Readily available ✓Up to date				
3.	**O&M and OSHA Training Records**		Readily available	Up to date	N/A
	Remarks with consultant				
4.	**Permits and Service Agreements**				
	Air discharge permit		Readily available	Up to date	~~N/A~~
	Effluent discharge NPDES		✓Readily available	✓Up to date	N/A
	Waste disposal, POTW (backwash)		✓Readily available	✓Up to date	N/A
	Other permits DNR appropriation		✓Readily available	✓Up to date	N/A
	Remarks				
5.	**Gas Generation Records**		Readily available	Up to date	✓N/A
	Remarks				
6.	**Settlement Monument Records**		Readily available	Up to date	✓N/A
	Remarks				
7.	**Groundwater Monitoring Records**		✓Readily available	✓Up to date	N/A
	Remarks				
8.	**Leachate Extraction Records**		Readily available	Up to date	✓N/A
	Remarks				
9.	**Discharge Compliance Records**				
	Air		Readily available	Up to date	~~N/A~~
	Water (effluent)		✓Readily available	✓Up to date	N/A
	Remarks				
10.	Weekly **Daily Access/Security Logs**		✓Readily available	✓Up to date	N/A
	Remarks				

Annual reports have changes

Assure on-site

IV. O&M COSTS

1. **O&M Organization**
   State in-house ✓ Contractor for State
   PRP in-house Contractor for PRP
   Federal Facility in-house Contractor for Federal Facility
   Other _____

2. **O&M Cost Records**
   ✓ Readily available ✓ Up to date
   ✓ Funding mechanism/agreement in place
   Original O&M cost estimate GWS $250,000/yr Breakdown attached ✓
   SVES 140,000/yr
   Total annual cost by year for review period if available

From _____ Date	To _____ Date	_____ Total cost	Breakdown attached
From _____ Date	To _____ Date	_____ Total cost	Breakdown attached
From _____ Date	To _____ Date	_____ Total cost	Breakdown attached
From _____ Date	To _____ Date	_____ Total cost	Breakdown attached
From _____ Date	To _____ Date	_____ Total cost	Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons. _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable N/A

A. Fencing

1. **Fencing damaged** Location shown on site map Gates secured ~~N/A~~
   Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
   Remarks locks - all wells & building.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes / No / N/A
Site conditions imply ICs not being fully enforced — Yes / No / N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)

Reporting is up-to-date — Yes / No / N/A
Reports are verified by the lead agency — Yes / No / N/A

Specific requirements in deed or decision documents have been met — Yes / No / N/A
Violations have been reported — Yes / No / N/A
Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ✓ ICs are inadequate N/A
Remarks ICs not filed.

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident
Remarks One broken window in a building adjacent to the GAC plant building.

2. **Land use changes on site** N/A
Remarks No significant changes.

3. **Land use changes off site** N/A
Remarks School

VI. GENERAL SITE CONDITIONS

A. Roads ✓ Applicable N/A

1. **Roads damaged** ✓ Location shown on site map ✓ Roads adequate N/A
Remarks All road pavement repairs are in good condition. Some from piping installations

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS Applicable ~~N/A~~

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** — Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** — Slides — Location shown on site map — No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches — Applicable — N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** — Location shown on site map — N/A or okay
   Remarks_____

2. **Bench Breached** — Location shown on site map — N/A or okay
   Remarks_____

3. **Bench Overtopped** — Location shown on site map — N/A or okay
   Remarks_____

C. Letdown Channels — Applicable — N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** — Location shown on site map — No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** — Location shown on site map — No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** — Location shown on site map — No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment	Applicable	N/A
1. **Gas Treatment Facilities** Flaring Thermal destruction Collection for reuse Good condition Needs Maintenance Remarks		
2. **Gas Collection Wells, Manifolds and Piping** Good condition Needs Maintenance Remarks		
3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings) Good condition Needs Maintenance N/A Remarks		
F. Cover Drainage Layer	**Applicable**	**N/A**
1. **Outlet Pipes Inspected** Functioning N/A Remarks		
2. **Outlet Rock Inspected** Functioning N/A Remarks		
G. Detention/Sedimentation Ponds	**Applicable**	**N/A**
1. **Siltation** Areal extent_____ Depth_____ N/A Siltation not evident Remarks		
2. **Erosion** Areal extent_____ Depth_____ Erosion not evident Remarks		
3. **Outlet Works** Functioning N/A Remarks		
4. **Dam** Functioning N/A Remarks		

H. Retaining Walls		Applicable	N/A
1.	**Deformations**	Location shown on site map	Deformation not evident
	Horizontal displacement_____	Vertical displacement_____	
	Rotational displacement_____		
	Remarks_____		
2.	**Degradation**	Location shown on site map	Degradation not evident
	Remarks_____		
I. Perimeter Ditches/Off-Site Discharge		Applicable	N/A
1.	**Siltation**	Location shown on site map	Siltation not evident
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Vegetative Growth**	Location shown on site map	N/A
	Vegetation does not impede flow		
	Areal extent_____	Type_____	
	Remarks_____		
3.	**Erosion**	Location shown on site map	Erosion not evident
	Areal extent_____	Depth_____	
	Remarks_____		
4.	**Discharge Structure**	Functioning	N/A
	Remarks_____		
VIII. VERTICAL BARRIER WALLS		Applicable	N/A
1.	**Settlement**	Location shown on site map	Settlement not evident
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Performance Monitoring** Type of monitoring_____		
	Performance not monitored		
	Frequency_____	Evidence of breaching	
	Head differential_____		
	Remarks_____		

IX. GROUNDWATER/SURFACE WATER REMEDIES ✓Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ✓Good condition ✓All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ✓Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks ? Check w/ Eric (Yes)

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable ✓N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal
   - Oil/water separation
   - Bioremediation
   - Air stripping
   - ✓ Carbon adsorbers
   - Filters
   - Additive (*e.g.*, chelation agent, flocculent)
   - Others
   - ✓ Good condition
   - Needs Maintenance
   - ✓ Sampling ports properly marked and functional
   - ✓ Sampling/maintenance log displayed and up to date
   - ✓ Equipment properly identified
   - ✓ Quantity of groundwater treated annually 250 gpm
   - Quantity of surface water treated annually
   - Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - N/A
   - ✓ Good condition
   - Needs Maintenance
   - Remarks

3. **Tanks, Vaults, Storage Vessels**
   - N/A
   - ✓ Good condition
   - Proper secondary containment
   - Needs Maintenance
   - Remarks

4. **Discharge Structure and Appurtenances**
   - N/A
   - ✓ Good condition
   - Needs Maintenance
   - Remarks

5. **Treatment Building(s)**
   - N/A
   - ✓ Good condition (esp. roof and doorways)
   - Needs repair
   - ✓ Chemicals and equipment properly stored
   - Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   - ✓ Properly secured/locked
   - ✓ Functioning
   - ✓ Routinely sampled
   - ✓ Good condition
   - ✓ All required wells located
   - Needs Maintenance
   - N/A
   - Remarks

D. Monitoring Data

1. Monitoring Data
   - ✓ Is routinely submitted on time
   - ✓ Is of acceptable quality

2. Monitoring data suggests:
   - ✓ Groundwater plume is effectively contained
   - Contaminant concentrations are declining

but need aerobic evaluation of data to confirm control
- new sentinel MW between plume + CW3 location identified.

D. Monitored Natural Attenuation

1. **Monitoring Wells (natural attenuation remedy)**
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance ✓N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. has been dismantled.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Long Prairie Ground Water Contamination Superfund Site
Five-Year Review
Site Inspection Checklist Supplement
July 31, 2002

Inspection Team

Maureen Johnson, Project Manager, Minnesota Pollution Control Agency (MPCA)
Mark Elliott, Hydrogeologist, MPCA
Sheila Sullivan, Regional Project Manager, U.S. Environmental Protection Agency (EPA)
J. Eric Gabrielson, O&M Manager, Barr Engineering Company (Barr)
Eric Gohl, O&M Technical Assistant and Chemist, Barr

II. Interviews

1. O&M Site Manager, J. Eric Gabrielson, Barr
2. O&M Staff, Technical Assistant, Eric Gohl, Barr

Eric Gabrielson and Eric Gohl accompanied us on the inspection and answered questions as documented in the inspection record below.

3. Dave Vennekamp, Administrator, City of Long Prairie
   Pat Meier, Public Works Superintendent, City of Long Prairie

We discussed that notices will be sent to those on our mailing lists. We should assure notice to the Long Prairie River Stewardship group and to Kitty Tepley at the Todd County Watershed District (check name). MPCA is developing a partnership with this District.
The City is constructing a new wastewater treatment plant in a different area. An industry is utilizing the old pond system. A new water tower has been built this year, which receives water sand-filtered and treated with fluoride from city wells 3, 6, and three new wells to the south of the city.
Bud (Bernard) Roman is still living in the same place. Bud uses a private well that we plan to sample this year.
No complaints have been received at the City office, although they are aware of the activities of the Long Prairie River Stewardship Group and the local Watershed District.

Few changes are occurring within the city area of concern. The population is considered stable, although a few businesses are attracting Hispanic minorities to live in the city, which replaces other residents who move out. In 1990 the population was 2847; the 2000 census showed 3040 with about 10% Hispanic. We should consider making our notice available in Spanish, although Dave said most of these people live north west and outside

of the advisory area. On our walking survey we did observe some residents who appeared Hispanic.

We explained that we would be interested in any pumping effects from new wells, increased use of water due to expanded production lines. We expressed concern that new residents may not know about the contaminated ground water. We did observe an irrigation well in the back yard of one resident. The City will provide a map of the existing current water mains. The original water main blueprints will not show connections, but the 1986 and 1996 additions may. The City will update an old list of residents and parcel numbers showing who is on and off city water.

The senior high school north of the cemetery and in the area of CW 6 was built about five years ago with many heat pump wells that do not affect water movement. We should check on any irrigation that may be occurring for the sports fields.

Maureen expressed a desire to make use of the treated discharge water which is now discharging at the river. The water is treated to drinking water levels, and data from effluent sampling can allay any fears about significant contaminant breakthrough from the carbon. We recognized that the treatment system only removes about one-half of the iron, and we recalled that iron precipitation. We asked the City to keep an eye out for other possible uses, by nearby industry or for irrigation locally.

4. Motl Plumbing

An impromptu interview was attempted, but no one was present. We intend to follow up with this company by telephone to verify bottled water is still being provided.

Inspection Record

We began the inspection at the business front of the old dry cleaner building at 243 Central Avenue. Several businesses have occupied the building since the dry cleaner left, and the building and Site source area are being used currently.

The back lot behind the building is the source area for the Site. The alley runs through a parking lot and service area for the businesses on the block. The old incinerator referred to in the RI report is still present, but the barrel used as a french drain has been removed. All the monitoring wells are present, in good secure condition, and protected by bumper posts. All of the above ground SVES facility has been removed. The SVES piping was as abandoned as if it were a well with concrete tremie, but, rather than many blacktop patches, the concrete access pads remain as part of the parking lot surface.

We walked the route of the SVES recovery wells pipe down the alley to Third Street, where the redone street pavement could be seen. Northward on Third, we walked the heart of the plume.

No one was present at Motl Plumbing (it was the noon hour). Motl could not be connected to the city water main in the original advisory area because of the condition of its foundation. The business owners provide bottled water for the employees.

We inspected the monitoring wells and recovery wells along the route, all in good condition and secure. RW 4 usage was discontinued in 1983 when it was found to be not located in the plume as projected and because its iron content was high. The original design of the recovery system assumed the plume direction was controlled by the pumping of the contaminated city wells 4 and 5, and that the plume would move toward the river when the city wells were turned off. Instead, it now appears that the natural direction of ground water flow and the city wells draw were coincidental. RW 5 is the old City Well 5 in a small building. We opened the building and noticed the typical precipitated iron. We commented that so many of the residents of Long Prairie were affected and have cooperated so fully with the RA needs. There was no situation that could not be negotiated during the water main and wells installations.

We observed an irrigation well in the back yard of one resident, causing concern that some homes have new ownership and the new residents may not know about the contaminated ground water. Sand points are easy to install here without a well driller. We are aware of at least one resident who does know and refused to allow his irrigation well to be abandoned. This caused feelings of unfair treatment for some residents in the past. We are continuing to encourage the MDH to provide a well drilling advisory area designation, so that drillers must provide notice to MDH of any new wells planned to be installed and MDH can provide special instructions if necessary.

RW 8 and RW9 with accompanying monitoring wells are new to protect the wetland and river. The edge area of the wells drops sharply about four feet to a shrub wetland with several species of willow and dogwood, and grasses and forbs that are not overcome by occasional patches of canary reed grass. RW 9 is near a turn in a snowmobile trail so it is well marked and has photosensitive lighting. The wells were constructed pursuant to a recommendation by Curt Wunderlich from the MDH that lateral support bars be welded to the outer well casing and set in the cement footing. A load of sand originally covered the footing but has been mostly washed away by rain storms. We agreed that Barr would monitor the stability of the wells and if necessary would add top soil and seeding.

We discussed the monitoring of the wetland wells, that both shallow and deep should continue to be monitored as compliance points. Concentrations are very low now. If the concentrations rise, then we should be more concerned about any plume contaminants going under the river.

Barr evaluates the system effectiveness yearly in the annual report. Sheila said the EPA Technical Assistance Office was interested in Long Prairie as a project for optimizing the system, that Long Prairie was not originally selected, but it was still being monitored, and she would check on the current status of the project at the TAO.

At the plant, the area is in good condition. No fence is needed. The treatment building is secure, although a nearby closed sewage treatment plant has one window out. The discharge at the river is submerged beneath the surface of the flow.

The Long Prairie Stewardship group was concerned about the low concentration of oxygen in the plant discharge to the river. An air break mechanism adds air at the plant, in addition to aeration opportunities at the three manholes on the way to the river. The combination of sources is yielding 7 ppm oxygen in the effluent, which is usually higher than the river oxygen.

Three weeks ago a rainstorm caused flooding in some areas near the building but no problems resulted for the plant. The building is on a pad one inch above the 100 year flood elevation, which also protected it in a major flood during the spring of 2000, when water flowed all around but did not enter the building.

Photos

Photos were taken during the inspection, included with this supplement.

XI. Overall Observations

A. Implementation of the Remedy

The remedy was designed to accomplish:

1. *Providing a safe drinking water supply* for present and future users of the Long Prairie Sand Plain aquifer, which includes:
   - A. restoration of the ground water aquifer to 5 ug/l or less PCE;
   - B. an alternate water supply for persons using the contaminated portions of the aquifer;
   - C. cleanup of the soils at the source of the plume to 1,200 ug/kg PCE.

2. *Preventing spread of contaminated ground water to wells* presently unaffected, including the City of Long Prairie municipal supply wells #3 and #6.

Issues and observations relating to whether the remedy is effective and functioning as designed:

The core concentrations of the plume have decreased significantly from thousands to hundreds of ppb.
This indicates that the removal of the source of the plume with the SVES to the levels required in the ROD was an effective part of the remedy.

B. Adequacy of O&M

Issues and observations related to the implementation and scope of the O&M procedures. Relationship to current and long term protectiveness of the remedy.
The O&M is being conducted as planned, adjustments have been made as described in annual reports, and the issues described below will be addressed in the future.

C. Early Indicators of Potential Remedy Problems

Issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

The lateral edge of the plume seems to be dissipating wider. So a receptor survey will be completed, a sentinel monitoring well for CW 3 will be installed, and additional monitoring will be evaluated.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Sheila Sullivan said she would check on the status of the Technical Assistance Office review of the Long Prairie site, with regard to their projects for optimization.

PHOTOS FROM FIVE-YEAR REVIEW SITE INSPECTION
Long Prairie Groundwater Contamination Site, July 31, 2002

Photo 1
From the back lot of 243 Central Street in Long Prairie. An old incinerator of unknown purpose is situated near the PCE source spot. Monitoring Well #10 (MW 10) is located in the southwest corner of the back lot source area.

Photo 2
From the back lot of 243 Central Street, Long Prairie, looking North. Recovery Well 1A (RW 1A), with the historically highest PCE concentration, is in the foreground. MW10A in the source area is visible in the mid-ground near RW 1A, and two recovery wells, RW 1B and RW 1C, are visible in the background against the buildings. Also visible are the abandoned soil vapor extraction piping access pads which were left in place as they are more durable than pavement patches.

Photo 3
An example of the monitoring well nests with bumper posts and locked caps. This monitoring well nest (MW 2A, 2B and 2C) is near the former city hall building at First Avenue and Third Street. The larger RW 3 is in the mid-ground.

Photo 4
The pump house for former City Well # 5, now retrofitted to serve as RW 5. RW 7 located on the corner of Fourth Avenue and Todd Street, is visible in the far background between the inspection team members.

Photo 5
RW 9 (left), and MW16 (right). These wells are adjacent to the wetland in the upper left background. The light pole is present for nighttime snowmobile safety.

PHOTO 1

PHOTO 2

Photo 3

Photo 4

PHOTO 5